



MINUTES OF THE PROCEEDINGS

OF THE

METEOROLOGICAL COUNCIL,

1890—1891.



LONDON:

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1892.

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Office

MINUTES OF THE PROCEEDINGS

OF THE

METEOROLOGICAL COUNCIL.

1890—91.

63, Victoria Street, April 2, 1890.

PRESENT :

MR. F. GALTON IN THE CHAIR.

PROFESSOR DARWIN. | MR. STONE.
THE HYDROGRAPHER.

The Secretary was in attendance.

The Minutes of the last meeting (March 19) were read and confirmed.

Read—The following letter (Minutes, 1889, p. 70) :—

(M.O. 607.)

DEAR MR. SCOTT,

The Royal Society, Burlington House,
London, W., March 21, 1890.

YOUR letter of January 9th was finally considered by the President and Council yesterday, and the officers were authorised to make representations to the Secretary of State for India on the basis of your letter, after consultation with the Meteorological Council. It was felt that the officers would be able in this way to make a more definite request than seemed possible from your letter alone.

Yours, &c.
(Signed) M. FOSTER,
Secretary R. S.

R. H. Scott, Esq.

Read—Letter 567 from Mr. Blanford, enclosing instructions for testing Violle's actinometer.

Mr. Scott was instructed to forward the instructions to the Kew Committee.

Mr. Scott submitted a provisional report by Mr. R. H. Curtis on the testing of the harmonic analyser, and was instructed to have the provisional report completed and submitted to Professor Darwin and Mr. Stone. Mr. Curtis was called down and received verbal instructions from Professor Darwin.

Read—The following memorandum :—

I BEG to submit herewith the Charts of Cape Guardafui (Minutes, 1888, p. 24), of which the specimens were submitted to the Hydrographer, as directed in July of that year, and approved of by him.

(Signed) C. W. BAILLIE.

The charts were approved, and Mr. Scott was instructed to proceed with the engraving and issue of the work after submission to the Chairman.

Mr. Scott stated that there existed in the Office the material for Monthly Wind Charts of the North Atlantic, prepared under Admiral FitzRoy's superintendence. Of these only the charts for four months (February, May, August, and November) had been issued. Mr. Scott now asked if the charts for the remaining eight months were to be published.

The subject was referred to the Hydrographer.

Read—A memorandum from Mr. Baillie, stating that since last meeting seven logs had been received, and that four of them were "excellent."

Mr. Scott was instructed to present the charts (O. 27) to Captains Worrall and Pasifull, and to convey the thanks of the Council to the other observers.

Read—The following circular:—

(M.O. 659.)

St. Pétersbourg et Londres,

ce 24 Mars 1890.

MONSIEUR ET TRÈS-HONORÉ COLLÈGUE,

LES soussignés ayant été chargé par le Comité international de Météorologie lors de sa dernière réunion à Zurich (Septembre 1888), de faire des démarches pour provoquer en temps opportun une réunion internationale des représentants des différents services météorologiques croient le moment venu pour discuter l'opportunité d'une telle réunion au courant de l'année prochaine et en fixer le programme en cas d'un assentiment général. À cet effet, ne sachant pas bien quels services météorologiques dans les différents pays seraient à considérer pour être représentés dans cette réunion, nous nous adressons avec cette circulaire préliminaire qu'aux directeurs des services météorologiques principaux des différents états d'Europe énumérés en bas.

Nous vous prions donc de vouloir bien nous communiquer aussitôt que possible votre opinion concernant les questions suivantes:—

1°. Est-ce-qu'il paraît utile de convoquer au courant de 1891 une réunion internationale des représentants des différents services météorologiques?

2°. En cas d'assentiment à quelle époque de l'année et où doit avoir lieu cette réunion?

3°. Qui avons nous, en dehors de vous-même, à considérer comme chefs de services météorologiques dans votre pays et en conséquence à inviter pour cette réunion?

4°. Est-ce-que cette réunion doit se borner aux représentants des services météorologiques en Europe ou devons nous inviter aussi ceux de l'Amérique, de l'Australie, de l'Asie et de l'Afrique?

5°. Pour pouvoir établir aussitôt que possible au moins un programme provisoire des questions traiter par cette réunion veuillez nous faire savoir les questions que vous avez en vue dès-à-présent?

Conformément aux réponses reçues nous adresserons une seconde circulaire à tous les représentants désignés par vous pour fixer définitivement l'endroit et l'époque de la réunion et nous l'accompagnerons d'un programme préliminaire de questions avec la prière de la compléter aussitôt que possible. Veuillez, s'il vous plaît, adresser vos réponses à M. Wild, directeur de l'Observatoire physique central à St. Pétersbourg.

Agrez, Monsieur et très-honoré Collègue, l'assurance de notre considération distinguée,

(Signed) H. WILD.

R. H. SCOTT.

Read—The following memorandum:—

WIND EXPERIMENTS AT HERSHAM.

On March 20th Mr. Buchan and I went to Hersham to see Mr. Dines's experiments on wind pressure. The weather was exceptionally bad, and we found an hour or so in the rain and cold wind enough for our patience. I think, however, that we had in that time thoroughly inspected the machine, although of course there was not sufficient time to make any systematic experiments.

Mr. Dines seems to have carried out the experiments admirably, but much yet remains to be done. He showed us the way of determining the pressure both for perpendicular and oblique incidence of the current on the board. He finds that if the surface of the board is wet the pressure is greater than if it is dry. This result does not appear to be due directly to tangential action on the board, for I understand that he has not been able in any case to find a measurable tangential component of pressure on the board.

I conceive that the state of the surface of the board may be important in determining the amount and intensity of the eddies which must be generated as the wind passes round the board.

The considerable degree of uncertainty which exists as to the amount of pressure on the board seems not to be due to what may fairly be called errors of observation, but is probably explicable by variability in the size of these eddies within certain limits. Without going into details it appears obvious that the amount of resistance experienced will vary with that size. It may then be true that it is not possible to specify exactly the resistance in any position, but only to say that the wind resistance will be within certain limits. I suggested to Mr. Dines that it would be interesting to try variations in the nature of the surface of the board, as by covering it with cloth, and I hope he will do this.

The latter part of our time was devoted to endeavours to trace the direction of the air currents on the surface of the board by means of tufts of silk attached to it as was done by Mr. Osler. This method was very successful, and I think it will be possible to plot out the direction of stream lines all over the surface. The variation of stream lines as the inclination of the current becomes greater is very interesting.

We told Mr. Dines that his experiments were most interesting, and urged on him the desirability of giving a full account of them when he has done all that he has leisure or desire to undertake. Such a paper might, we thought, be properly communicated to the Royal Society by the Council.

We also expressed our opinion that the Council would be willing to defray further expenses in the course of experiment.

Mr. Munro's bill for the present instrument is to be sent to the Meteorological Office, and will not be paid by Mr. Dines.

(Signed) G. H. DARWIN.

April 3rd, 1890.

It was resolved that the visits of Professor Darwin and Mr. Buchan to Hersham (March 20), be counted for attendances.

Submitted—The following report on the 8.30 p.m. forecasts for February 1890 :—

The letters used have the following signification :—

a=complete success.

b=partial (i.e., more than half) success.

c=partial failure.

d=total failure.

DISTRICTS.		Percentages.			Percentage of Success. a + b.
		Wind.	Weather.	Average Forecast.	
SCOTLAND, N.	a	64	54	59	86
"	b	22	32	27	
"	c	14	7	11	
"	d	0	7	3	
SCOTLAND, E.	a	64	57	61	86
"	b	22	29	25	
"	c	14	4	9	
"	d	0	10	5	
ENGLAND, N.E.	a	54	46	50	84
"	b	32	36	34	
"	c	7	4	6	
"	d	7	14	10	
ENGLAND, E.	a	68	57	63	86
"	b	18	29	23	
"	c	11	7	9	
"	d	3	7	5	
MIDLAND COUNTIES	a	64	54	59	77
"	b	11	25	18	
"	c	18	11	15	
"	d	7	10	8	
ENGLAND, S.	a	71	47	59	93
"	b	21	46	34	
"	c	4	4	4	
"	d	4	3	3	
SCOTLAND, W.	a	71	43	57	79
"	b	18	25	22	
"	c	11	11	11	
"	d	0	21	10	
ENGLAND, N.W.	a	68	46	57	82
"	b	18	32	25	
"	c	7	11	9	
"	d	7	11	9	
ENGLAND, S.W.	a	36	64	50	77
"	b	36	18	27	
"	c	7	18	13	
"	d	21	0	10	
IRELAND, N.	a	43	57	50	84
"	b	39	29	34	
"	c	11	7	9	
"	d	7	7	7	
IRELAND, S.	a	57	64	61	86
"	b	25	25	25	
"	c	7	7	7	
"	d	11	4	7	
SUMMARY.					
BRITISH ISLES	a	60	53	57	84
"	b	24	30	27	
"	c	10	8	9	
"	d	6	9	7	

Submitted—The following statement respecting the Records for July to December, 1889, received from the Self-recording Observatories (see Minutes, 21st December, 1868; 20th November, 1876; 3rd January, 1883; and 6th March, 1889):—

JULY-DECEMBER, 1889.	ABERDEEN.		ARMAGH.		FALMOUTH.		KEW.		VALENCIA.	
ANEMOGRAPH :—	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.
Action of Instrument - - -	Good.	Good.	Good.	Fair.	Good.	Good.	Good.	Good.	Good.	Good.
Records deficient :—										
Due to stoppage of clock - - -	0	0	85 hrs.	96 hrs.	0	0	0	0	0	0
„ other causes - - -	2 hrs.	4 hrs.	75 hrs.	78 hrs.	5 hrs.	19 hrs.	0	0	22 hrs.	14 hrs.
Number of errors discovered :—										
By general examination - - -	0	0	4	10	21	19	3	0	16	3
Results of 40 Remeasurements :—										
Greatest difference - - -	1·0	2·0	1·0	2·0	1·0	2·0	1·0	2·0	1·0	2·0
Mean difference irrespective of sign -	0·2	0·5	0·2	0·4	0·2	0·4	0·1	0·4	0·2	0·5
Residual difference (— Meteorological Office)	0·0	0·0	0·0	0·0	+ 0·1	0·0	0·0	0·0	0·0	+ 0·1
Orientation verified - - -	Monthly	—	Monthly	—	Monthly	—	Monthly	—	Monthly	—
RAIN GAUGE :—										
Action of Instrument - - -	Good.		Good to Bad.		Indifferent.		Good.		Good.	
Records deficient :—										
Due to stoppage of clock - - -	0		207 hrs.		40 hrs.		2 hrs.		0	
„ other causes - - -	3 hrs.		16 hrs.		0		3 hrs.		1 hr.	
Number of errors discovered :—										
By general examination - - -	15		13		37		7		13	
—	ABERDEEN.		FALMOUTH.		KEW.		VALENCIA.			
BAROGRAPH :—										
Action of Instrument - - -	Good to Fair. {		Good. Do.		Good. Do.		Good. Do.		Good. Good to Bad.	
Character of Photography - - -										
Records deficient :—										
Due to stoppage of clock - - -	0		3 hrs.		0		1 hr.			
„ failure of light - - -	0		0		0		0		0	
„ other causes - - -	0		10 hrs.		4 hrs.		4 hrs.			
Number of errors discovered :—										
In entry of standards - - -	0		44		2		0			
„ calculating residuals - - -	0		9		1		2			
„ applying „ - - -	0		9		4		28			
By general examination - - -	0		100		15		13			
Results of 40 Remeasurements :—										
Greatest difference - - -	·006		·006		·007		·007			
Mean difference irrespective of sign -	·002		·002		·002		·002			
Residual difference (— Meteorological Office)	·000		·000		+ ·001		·000			
Mean monthly difference between simultaneous Barograph and Standard Barometer readings - - -	·001		002		·002		·002			
THERMOGRAPH :—										
Action of Instrument - - -	Good. Fair.		Good. Do.		Good. Do.		Good to Indifferent. Fair to Good.			
Character of Photography - - -										
Records deficient :—										
Due to stoppage of clock - - -	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.
„ failure of light - - -	0	0	0	0	0	0	0	0	0	0
„ imperfectly moistened bulbs - - -	—	1 hr.	—	3 hrs.	—	4 hrs.	—	—	—	—
„ partially frozen bulbs - - -	—	25 hrs.	—	0	—	56 hrs.	—	—	—	—
„ other causes - - -	10 hrs.	10 hrs.	2 hrs.	2 hrs.	3 hrs.	14 hrs.	3 hrs.	12 hrs.	3 hrs.	12 hrs.
Number of errors discovered :—										
In entry of standards - - -	0	0	11	9	3	3	3	12	3	12
„ maxima and minima - - -	3	—	20	—	3	—	16	—	16	—
By general examination - - -	2	1	44	52	5	11	31	24	31	24
Results of 40 Remeasurements :—										
Greatest difference - - -	0·2	0·2	0·2	0·2	0·2	0·2	0·2	0·2	0·2	0·2
Mean difference irrespective of sign -	0·1	0·1	0·1	0·1	0·1	0·1	0·1	0·1	0·1	0·1
Residual difference (— Meteorological Office)	—0·1	0·0	—0·1	—0·1	—0·1	0·0	0·0	0·0	0·0	0·0
Mean monthly difference between simultaneous Thermograph and Standard Thermometer readings - - -	0·2	0·2	0·1	0·1	0·1	0·2	0·3	0·2	0·3	0·2

Aberdeen.

Rain-gauge.—The attachment was bad at the commencement of the period, but improved subsequently.

Anemograph.—In numerous instances the ends of traces are not sufficiently defined to allow of a check upon the stated times, and there are indications that the pricker mark and the traces are not always in accord.

Barograph.—There is a penumbra, or second edge, to the lower portion of the trace, which is probably caused by the light being too strong. During August and September a number of the curves were discoloured, caused by "a crack in the shutter" admitting light (see note under thermograph). The width of the temperature trace was materially altered on September 25th, and as a consequence, the residuals for the 25th–27th were greatly increased; the trace was restored to its usual state on the latter date.

Thermograph.—Secondary images disfigured the curves, and the photography in August and September was not altogether satisfactory; Mr. Boswell wrote:—

"I have discovered a crack in the shutter which I think has been the cause of the blackening of my sheets of late . . . I slip a cardboard down over the cylinder when changing, and the improvement yesterday was quite decided. The zero lines were changed from the summer to winter positions on September 21st, and on November 7th Mr. Boswell was obliged to lower the instruments by $2^{\circ} \cdot 5$ 'owing to the high temperatures'" ($61^{\circ} \cdot 0$). (See M.O. 1581—1889, with specimen papers.)

Armagh.

Rain-gauge.—There is a want of accord between the stated times of beginning and ending, and the ends of traces. The total given on the curves as "glass" total is the amount of water collected in the Beckley gauge, and is not such a check on the working of the self-recording gauge as the totals by a second gauge would be. The attachment of the papers during December was decidedly bad.

Anemograph.—The traces are intermittent at low velocities owing to a mechanical defect, and the ends of traces do not always agree with the stated times of beginning and ending. "The lubricant which had become very thick and dirty was replaced by fresh oil" in August.

Falmouth.

Rain-gauge.—The pencil was very unsteady in its action, and bagging is apparent in many of the curves.

Anemograph.—Satisfactory in its working.

Barograph.—In many cases the end of trace differs as much as 5' from the stated times of ending, but it is not quite clear as to how far this is caused by bad regulation of clock.

The definition of the lower edge is at times very unsatisfactory, probably due to the light being too strong.

Thermograph.—The definition of the traces (especially of the wet-bulb) is very indifferent at the lower values. Zero lines changed from summer to winter positions on October 25th.

Kew.

Rain-gauge.—The "Stonyhurst lifter" was acting imperfectly at times.

Anemograph.—The pricker frequently failed to mark, thereby removing a necessary check on the times of beginning and ending; when marking, however, the times indicated were not in close agreement with those stated. Mr. Whipple states that the pricker is very defective. Instrument oiled on November 4th.

Barograph.—A blur or penumbra to lower edge of trace at times, probably due to intensity of light. The regulation of the clock was bad throughout the period.

Thermograph.—A penumbra to both traces (especially the wet-bulb), and some of the curves are disfigured by slight secondary images. Zero lines changed from summer to winter positions on October 1st. Occasionally water is added just before the hour, interfering with the hourly value.

Valencia.

Rain-gauge.—The value of the records is affected by the want of care shown in attaching the papers.

Anemograph.—The agreement between the pricker marks and the traces is not always satisfactory.

Barograph.—The attachment of the papers is somewhat indifferent, and a blur or penumbra interferes with the proper definition of the lower edge of the traces.

Thermograph.—The definition of the traces is not always good, much depends upon the light, and where the lamps have been trimmed the traces are satisfactory; probably greater attention in this direction would do much to decrease the imperfection. Bagging was too prevalent. The traces are also greatly interfered with by secondary images, especially the dry, this is stated to have been caused by necessary over-development. Attention has been called to the varying breadth of the traces (on curve 327–328 the wet trace is $1^{\circ} \cdot 5$ in breadth, while on curve 331–332 it is only $0^{\circ} \cdot 8$), which has a material effect on the "S—T." differences. A number of Standards have been rejected, and in the large majority they differ from the tabulation by the amount of the I. E. of the instrument ($0^{\circ} \cdot 6$).

General.—At one or two of the observatories the “Code of Regulations” is not strictly adhered to, especially with regard to the entry of notes on the curves when water is added to the wet bulb, &c. The instruments were examined at the different observatories on the under-mentioned dates :—

Valencia	-	-	-	July 29th.
Armagh	-	-	-	August 6th and 7th.
Falmouth	-	-	-	„ 10th.
Aberdeen	-	-	-	September 24th–27th.
Kew	-	-	-	December 17th.

(Signed) THOMAS E. ALLEN.

Submitted—The following summary, as a result of the primary checking of the storm warnings issued to the coasts of the British Islands since the last meeting of the Council :—

1. WARNINGS ISSUED.

A + B (successful)	-	-	-	-	13
C (failures)	-	-	-	-	5

2. GALES EXPERIENCED, BUT FOR WHICH NO WARNINGS WERE ISSUED.

None.

(Signed) FREDC. GASTER.

Telegraphic Branch,
2nd April 1890.

Submitted—The following reports of work during March 1890 :—

MARINE BRANCH.

April 1st, 1890.

Examined 13 new logs and 4 lighthouse registers.

Discussion of wind, barometer, air and sea temperature, ice, and whale observations in M.O. logs in the district south of latitude 35° S., between the Cape of Good Hope and New Zealand.

Charting current observations from the remark books kept on board Her Majesty's ships, lent for the purpose by the Hydrographic Department. The total number of books received during the month was 1,078.

Completing, for reproduction by the lithographer, the monthly and annual charts of cyclone tracks in the South Indian Ocean, and the monthly charts of sea temperature, wind, and other elements in the neighbourhood of Cape Guardafui.

Indexing data in ocean 10-degree squares.

(Signed) CHAS. HARDING.

The Marine Superintendent.

Forwarded for the information of the Council.

(Signed) C. W. BAILLIE.

TELEGRAPHIC (FORECAST AND STORM WARNING) BRANCH.
(To 31st March 1890.)

Monthly Weather Report, 1887.—May number in printer's hands.

Weekly Weather Report, 1888.—Monthly Summaries. *May* printed and copies delivered to Meteorological Office; *June*, *July*, and *August*, in proof.

Weekly Weather Report, 1889.—Monthly Summaries. Title-page and preface, all printed and revised—copies for delivery expected daily.

Weekly Weather Report, 1890.—*All weekly numbers* issued promptly. Monthly Summaries, January and February, both in printer's hands.

Daily Weather Report, 1890.—Copies all promptly issued. Correction and addition sheets issued, to that for February.

Primary Checking of Storm Warnings.—Done to date.

Checking of Daily Forecasts.—Done almost to date.

During the month Mr. Brodie has attended regularly and to full duty.

(Signed) FREDC. GASTER.

Telegraphic Branch,
2nd April 1890.

PANTAGRAPH ROOM.

April 1st, 1890.

Observatory Returns.—The calculation of the hourly means for five-day periods for the latter half of 1887 is in progress. The computation of the hourly wind components for that period has been completed.

Quarterly Weather Report.—The letterpress, tables, and plates of Part II., 1880, are now ready for press.

Harmonic Analysis.—The testing of the results obtained from the instrument, on the lines suggested by the Council, is in progress, and a year's temperature curves for one observatory have been re-analysed; the results, however, have not yet been fully examined.

Miscellaneous.—Some curves, &c. were prepared for exhibition at the Royal Meteorological Society. The hourly means of pressure and temperature have as usual involved a good deal of time during the month.

(Signed) R. H. CURTIS.

R. H. Scott, Esq., F.R.S.

EXAMINATION BRANCH.

April 1st, 1890.

Examinations.

November and December, 1889, January, 1890.—Completed.

Weekly examination of curves and documents (on receipt) from all observatories.

Reports, &c.

October to December, 1889.—"Notes of Errors" to all observatories, and monthly reports thereon.

July to December, 1889.—Report on work to Council.

Various memoranda respecting the Falmouth work, and investigations *re* the Falmouth and Kew barometer residuals.

(Signed) T. E. ALLEN.

Submitted—The following list of publications which had been received since the last meeting :—

Calcutta, Meteorological Office.—Report on the administration of the meteorological department of the Government of India in 1888-89.

— Preliminary report on the meteorology for the year 1888.

Hamburg, Deutsche Seewarte.—Deutsches meteorologisches Jahrbuch für 1888.

Liverpool Observatory.—Results of meteorological observations during the years 1879 to 1883.

— Report . . . on the arrangements made . . . for enabling mariners to find the Greenwich time at sea by chronometers.

Rugby School Natural History Society.—Report. 1889.

Hoffmann, H.—Ueber phaenologische Accommodation.

Pekin, Inspector General of Customs.—Medical reports for the half-year ended 30th September 1887.

— List of the Chinese lighthouses, light-vessels, buoys, and beacons for 1890.

Leyst, E.—Untersuchungen über den Einfluss der Ablesungstermine der Extrem-Thermometer auf die aus ihnen abgeleiteten Extrem-Temperaturen und Tagesmittel der Temperatur.

63, Victoria Street, April 23, 1890.

PRESENT :

LIEUT.-GENERAL STRACHEY IN THE CHAIR.

MR. BUCHAN.
PROFESSOR DARWIN.

MR. GALTON.
MR. STONE.

THE HYDROGRAPHER.

The Secretary was in attendance.

The Minutes of the last meeting (April 2) were read and confirmed.

The first draft of the Report of the Council for the year ending March 31, 1890 was submitted.

Read—Letter 763 from the Hydrographer, requesting that information existing in the Meteorological Office, “whether completed or not, should be available for use “by the Hydrographic Department in the preparation of publications for the service “of mariners.”

Mr. Scott was instructed to reply (P.C. 814) that the Council would be happy to meet the wishes of the Hydrographer in this matter.

Mr. Scott stated that there were still upwards of 50 of the fishery barometers which had not yet been inspected, situated mainly on the south coasts of England and Ireland. He was instructed to request Captain Toynbee to inspect these stations in the course of the coming summer.

Read—A memorandum from Mr. Baillie stating that since the last meeting nine logs had been received, seven of them being “excellent.” Mr. Scott was instructed to present the charts (O. 59) to Lieut. Somerville, and to convey the thanks of the Council to the other observers.

Submitted—The following summary, as a result of the primary checking of the storm warnings issued to the coasts of the British Islands, since the last meeting of the Council :—

1. WARNINGS ISSUED.

SUMMARY.

A + B (successful)	-	-	=	6
C (failures)	-	-	=	4

2. GALES EXPERIENCED, BUT FOR WHICH NO WARNINGS WERE ISSUED.

A strong gale from the northward was experienced on the extreme east coast of Scotland on April 8. The gale came on *very gradually* in the rear of a depression which grew deeper as it passed away to the eastward across the North Sea. The growth of the depression could not be accurately foreseen, inasmuch as it occurred during the night and early morning of the 7th—8th.

(Signed) FREDC. GASTER.

Telegraphic Branch,
23rd April 1890.

Submitted—The report by Mr. R. Curtis (Minutes, p. 1) on the testing of the harmonic analyser, which was referred to Professors Darwin and Stone.

Submitted—A report by Mr. R. Curtis on the working of the electrical anemometer (Minutes, 1889, p. 96). Mr. Scott was instructed to forward it to Mr. Whipple for remarks.

Read—Letter 727 from Mr. Buchan, stating that the station at Swanbister in the Orkneys was about to be transferred to Stenness schoolhouse in the same island, where Mr. Spence, the schoolmaster, had undertaken to carry on the observations hitherto recorded by Mr. W. Irvine Fortescue. Approved.

Read—An application from the Liverpool Free Public Library, stating that Mr. W. W. Rundell had presented to that Institution his set of the publications of the Office, and requesting that future works might be sent there also.—Sanctioned.

Submitted—The following statement of accounts for the year ending 31st March 1890 :—

[illegible]

LIABILITIES.		ASSETS.	
	<i>£ s. d.</i>		<i>£ s. d.</i>
Ce contracts and outstanding accounts -	461 18 1	By cash at Bank -	- - - 3,333 17 4
Post Office (partly estimated) -	244 6 10	" " at Office -	- - - 82 9 4
" sundry creditors - -	465 17 11	" sundry debtors -	- - - 474 9 10
" balance - - -	2,718 13 8		
	£3,890 16 6		£3,890 16 6

* Some expenses under this head not yet brought to account.

Submitted—The following report on the 8.30 p.m. forecasts for March 1890 :—

The letters used have the following signification :—

a=complete success.

b=partial (i.e., more than half) success.

c=partial failure.

d=total failure.

MARCH.

DISTRICTS.		Percentages.			Percentage of Success. a + b.
		Wind.	Weather.	Average Forecast.	
SCOTLAND, N.	a	16	49	33	76
"	b	55	32	43	
"	c	26	6	16	
"	d	3	13	8	
SCOTLAND, E.	a	32	42	37	68
"	b	26	35	31	
"	c	29	10	19	
"	d	13	13	13	
ENGLAND, N.E.	a	36	29	33	70
"	b	26	48	37	
"	c	32	10	21	
"	d	6	13	9	
ENGLAND, E.	a	39	55	47	79
"	b	32	32	32	
"	c	19	3	11	
"	d	10	10	10	
MIDLAND COUNTIES	a	45	52	49	75
"	b	26	26	26	
"	c	23	16	19	
"	d	6	6	6	
ENGLAND, S.	a	49	45	47	76
"	b	26	32	29	
"	c	19	16	18	
"	d	6	7	6	
SCOTLAND, W.	a	39	26	33	73
"	b	29	52	40	
"	c	19	13	16	
"	d	13	9	11	
ENGLAND, N.W.	a	29	52	41	73
"	b	39	26	32	
"	c	26	6	16	
"	d	6	16	11	
ENGLAND, S.W.	a	26	55	41	76
"	b	52	19	35	
"	c	22	10	16	
"	d	0	16	8	
IRELAND, N.	a	36	58	47	88
"	b	42	39	41	
"	c	16	0	8	
"	d	6	3	4	
IRELAND, S.	a	19	42	31	76
"	b	45	45	45	
"	c	23	3	13	
"	d	13	10	11	
SUMMARY.					
BRITISH ISLES	a	33	46	40	75
"	b	36	35	35	
"	c	23	8	16	
"	d	8	11	9	

Submitted—The following list of publications which had been received since the last meeting :—

- Davis, W. M., and Curry, C. E.*—Ferrel's convectional theory of tornadoes.
- Greenwich, Royal Observatory.*—Results of the magnetical and meteorological observations made at the Royal Observatory, Greenwich, in the year 1887.
- Reduction of the photographic records of the barometer, 1874 to 1876, and of the dry-bulb and wet-bulb thermometers, 1869 to 1876, made at the Royal Observatory, Greenwich.
- Palermo, R. Osservatorio.*—Osservazioni meteorologiche. 1884-85.
- Augustin, F.*—Untersuchungen über die Temperatur von Prag.
- Greenwood, W. N.*—A discussion of a series of tidal observations, taken at 18 stations on the West Coast of England and Scotland, to determine the effect of atmospheric pressure on the wave, during November 1888.
- Azambuja, G. A. de.*—Anuario da Provincia do Rio Grande do Sul. 1889.
- Meyer, H.*—Die Winde zu Keitum auf Sylt, mit einer Einleitung, die Darstellung der Windverhältnisse eines Ortes betreffend.
- Hazen, H. A.*—Instructions to voluntary observers of the Signal Service.
- Tornadoes.
- Anemometer comparisons.
- The relation between wind velocity and pressure.
- Cloud formation.
- Pressure and temperature in low and high.
- Determination of prevailing wind direction.
- Storms and a central ascending current.
- St. Petersburg, Physikalisches Central Observatorium.*—Annalen. 1888. Theil II.
- Manila, Observatorio Meteorológico.*—Curvas meteorográficas. 1888.
- Toronto Magnetical Observatory.*—General meteorological register. 1889.
- Palermo, R. Osservatorio.*—Bullettino della sezione meteorologica a Valverde. 1884-86.
- González, B. G.*—Ensayo de meteorognosia de la Ciudad de Puebla.
- Pool, W.*—The Antananarivo Annual and Madagascar Magazine. Nos. xii. and xiii.
- Shortt, J.*—Map of rainfall in Tasmania. 1889.
- Habenicht, H.*—Die Ursachen der Cyklone des nordatlantischen Oceans.
- Yorkshire Philosophical Society.*—Annual report for 1889.
- Zürich, Schweiz. Departement des Innern.*—Graphische Darstellung der schweizerischen hydro-metrischen Beobachtungen. 1889. July—Dec.
- Stelling, E.*—Magnetische Beobachtungen im Lena-Gebiet im Sommer 1888.
- Bemerkungen zu den meteorologischen Beobachtungen des Observatoriums in Irkutsk für das Jahr 1888.
-

63, Victoria Street, May 7, 1890.

PRESENT:

LIEUT.-GENERAL STRACHEY IN THE CHAIR.

PROFESSOR DARWIN.
MR. GALTON.

MR. STONE.
THE HYDROGRAPHER.

The Secretary was in attendance.

The Minutes of the last meeting (April 23) were read and confirmed.

Read—The following letter (Minutes, p. 51) :—

(M.O. 859.)

Hydrographic Department, Admiralty, S.W.,
May 6, 1890.

SIR,

I HAVE carefully considered the unpublished matter collected by Admiral Fitzroy for meteorological monthly charts of the North Atlantic to 40° N., and am decidedly of opinion that its publication is not desirable.

The southern half is already covered by a publication of the Meteorological Office, the northern half by one of United States Signal Office; and though the latter is by no means complete or satisfactory, I scarcely think the present material, dating only to 1859, would afford means to improve upon it.

Should this area be taken up eventually, the present material might be added to and then made worthy of production, but the area should be extended to the north.

(Signed) W. J. WHARTON,
6th May 1890.

Secretary, Meteorological Office.

Read—Mr. Whipple's memorandum on the electrical anemometer (M.O. 799) (Minutes, p. 8). Mr. Scott was instructed to write to the Post Office, requesting them to take down the wire, &c. at Kilbeg Hill, Valencia, and to allow the Council to terminate the agreement with them for that service. (P.C. 910.)

Mr. Scott reported that Sir G. Stokes had suggested a re-arrangement of the cups on the bridled anemometer at Holyhead so as to prevent interference between the cups (Minutes, 1889, p. 15), and that by his (Mr. Scott's) directions the shaft and cups had been sent up from Holyhead to Mr. Munro, where Sir G. Stokes had inspected them. Mr. Scott reported that he had written (P.C. 714) to Mr. Munro telling him to carry out any instructions Sir G. Stokes might give.—Approved.

Read—A memorandum from Mr. Baillie, stating that since last meeting four logs had been received, three of them being "excellent."

Mr. Scott was instructed to convey the thanks of the Council to the observers.

Submitted—The following summary as a result of the primary checking of the storm warnings issued to the coasts of the British Islands since the last meeting of the Council :—

(1.) WARNINGS ISSUED.

Summary.

A + B (successful)	-	-	-	-	=	5
C (failures)	-	-	-	-	=	12

(2.) GALES EXPERIENCED, BUT FOR WHICH NO WARNINGS WERE ISSUED.
None.

(Signed) FREDC. GASTER.

Telegraphic Branch,
7th May 1890.

Mr. Scott reported that the period for issue of Hay Harvest Forecasts was approaching. He was instructed to address the Agricultural Department again on the subject (Minutes, 1888, p. 42). (P.C. 907.)

Submitted—The following statements of work during April 1890:—

MARINE BRANCH.

May 6, 1890.

Examined 14 new logs.

Discussion of the observations in the district between the Cape of Good Hope and New Zealand. The cyclone track charts for the South Indian Ocean from 1848 to 1885, monthly and annual—18 sheets in all—have been completed and forwarded to the lithographer for reproduction.

Advancing the preparation of the charts of Red Sea data for lithographing. The charts of sea temperature, &c. for the vicinity of Cape Guardafui are in a similar stage of advancement.

Charting the observations of ocean currents in the Remark Books of Her Majesty's ships lent for that purpose by the Hydrographic Department, the number of such books received during the month being 516.

(Signed) CHAS. HARDING.

The Marine Superintendent.

Forwarded for the information of the Council,

(Signed) C. W. BAILLIE.

TELEGRAPHIC (FORECAST AND STORM WARNING) BRANCH.
(To 30th April 1890.)

During this month the whole of the available time of the staff, in excess of that required for ordinary routine work, has been devoted to working up the arrears of the Monthly Reports for 1887, and the Monthly Summaries for 1888 to 1890, with following results:—

Monthly Weather Reports, 1887.—*May* and *June* are in proof, and *July* is nearly ready for printer.

Monthly Summaries:—

1888. All numbers to *November* are in printer's hands, all up to *August* are in type and some are revised; *May* is ready for issue.

1889. (All issued.)

1890. Numbers for *January* and *February* are in proof, and *January* is partly revised. *March* is in hand, and is well forward.

Weekly Weather Reports all issued promptly to date.

The preparation of Appendices I. to IV. is well up to date; Appendix I., Part 1 has been issued.

Daily Weather Reports all issued promptly to date; "Corrections and Additions" sheet for *March* is in hands of lithographer.

Checking of Storm Warnings Issued in 1889.—Commenced.

(Signed) FREDC. GASTER.

PANTAGRAPH ROOM.

May 1st, 1890.

The calculation of the hourly mean values from the four observatories is still in progress, and alterations in means already worked, necessitated by the new rule for dealing with low velocities of wind, are being carried out.

Quarterly Weather Report.—Proof of letterpress and plates for Part II., 1880, has been revised. The chart-plates for Part III., 1880, are in hand.

Harmonic Analysis. The testing of the results obtained from the machine has been completed, according to the directions of Professor Darwin, and a report prepared and submitted to the Council.

Miscellaneous.—The curves of the electric anemometer have been compared with those of the ordinary instrument at Kew, and a report on the working of the former instrument drawn up and submitted to the Council.

The sunshine records for Bunhill Row for the first three months of the year have been tabulated for the Royal Meteorological Society, and the ordinary routine work of the room kept well up to date.

(Signed) R. H. CURTIS.

R. H. Scott, Esq., F.R.S.

EXAMINATION BRANCH.

1st May 1890.

Examinations.

February and *March* 1890.—Completed, and examination work up to date.

Weekly examination (on receipt) of curves and documents from all observatories.

Reports, &c.

January and *February* 1890.—"Notes of Errors" to all observatories, and monthly reports thereon.

Miscellaneous.

Preparing Forms Nos. 30 and 31, and revising proof of same.

Various items, such as putting covers to the tabulations, &c., changing the notice boards on the balcony, work in connexion with the printing press, and going the daily rounds with the Daily Weather Reports, have occupied much of Messrs. Parsons and Hewitt's time during the month.

(Signed) T. E. ALLEN

The increments to the "classified" clerks referred to on Minutes 1884-85 pp. 118-9, and to the female clerks (Minutes 1888-9, p. 16), were allowed; the salaries which are changed for the current year are the following:—

	Salary in 1889-90.	Proposed for 1890-91.
CLASS I.—MAXIMUM 275<i>l</i>.	£ s. d.	£ s. d.
J. A. Curtis - - - - -	230 0 0	235 0 0 ✓
J. E. Cullum (Minutes, 1886-7, p. 98) - - - - -	235 0 0	240 0 0 ✓
CLASS II.—MAXIMUM 200<i>l</i>.		
A. J. Rigby - - - - -	195 0 0	200 0 0 ✓
H. Harries - - - - -	190 0 0	195 0 0 ✓
W. Allingham - - - - -	190 0 0	195 0 0 ✓
CLASS III.—MAXIMUM 150<i>l</i>.		
W. G. James - - - - -	145 0 0	150 0 0 ✓
R. Sargeant - - - - -	140 0 0	145 0 0 ✓
T. Sheerman - - - - -	140 0 0	145 0 0 ✓
CLASS IV.—MAXIMUM 110<i>l</i>.		
A. H. Bell - - - - -	100 0 0	105 0 0 ✓
R. J. Canham - - - - -	100 0 0	105 0 0 ✓
F. W. Snell (Minutes, 1888-9, p. 107) - - - - -	80 0 0	85 0 0 ✓
C. W. Heinemann (Minutes, 1886-7, p. 98) - - - - -	70 0 0	75 0 0 ✓
L. H. Powers (" 1887-8, p. 120) - - - - -	60 0 0	65 0 0 ✓
	Weekly 1889-90.	Weekly 1890-91.
	£ s. d.	£ s. d.
FEMALE CLERKS.		
E. D. Anderson, maximum 2 <i>l</i> . (Minutes, 1888-9, p. 16) - - -	1 17 6	2 0 0
M. S. Harris, " 30 <i>s</i> . " - - -	1 6 6	1 8 6
I. F. Baird " 30 <i>s</i> . " - - -	1 4 0	1 6 0 ✓
To date from 31st March.		
The following increments were allowed to the "unclassified" clerks, to date from 31st March:—		
F. E. Dash - - - - - 2 <i>s</i> . 0 <i>d</i> .	0 12 6	0 14 6
H. A. Hewitt - - - - - 1 <i>s</i> . 6 <i>d</i> .	0 10 0	0 11 6
A. H. Brown - - - - - 1 <i>s</i> . 6 <i>d</i> .	0 8 0	0 9 6

Mr. Scott reported that Commissionaire Morgan had been promoted to the rank of sergeant (Letter 869), and was entitled to 25*s*. a week. The addition of 4*s*. a week on his present wages was allowed accordingly, to date from the 5th instant.

Submitted—The following list of publications which had been received since the last meeting:—

Turin, Osservatorio della Regia Università.—Bollettino. Anno xxii., 1887.

Calcutta, St. Xavier's College Observatory.—Meteorological observations, July 1873 to December 1885.

Hamburg, Deutsche Seewarte.—Deutsche ueberseeische meteorologische Beobachtungen. Heft iii.

Schück, A.—Das Blatt der Kompassrose.

Peck, C. E.—Meteorological observations, 1889, at Rousdon Observatory.

Loefgren, A.—Dados climatologicos da Provincia de S. Paulo dos annos de 1887 e 1888.

Tokio, Imperial Meteorological Observatory.—Report of the meteorological observations in the Empire of Japan. November 1884 to April 1886.

— — Annual meteorological report. 1887, Part ii. 1888, Part i.

Hann, J.—Das Luftdruckmaximum vom November 1889 in Mittel-Europa, nebst Bemerkungen über die Barometer maxima im Allgemeinen.

Manila, Observatorio meteorológico.—Observaciones magnéticas verificadas por el P. Martin Juan en la Paragua, Joló y Mindanas. 1888.

Vienna, K. K. geographische Gesellschaft.—Mittheilungen 1889.

Tebbutt, J.—Report of Mr. Tebbutt's Observatory, the Peninsula, Windsor, N.S.W., 1889.

Denza, F.—La inclinazione magnetica a Roma.

— Le alte pressioni del Dicembre 1889 e Gennaio, 1890.

— L'anticiclone del Novembre 1889.

Fox, W. L.—Meteorological tables for Falmouth and the Scilly Islands, 1889.

Klossovsky, A.—Différentes formes des grêlons observés au sud-ouest de la Russie.

Rizzo, G. B.—Osservazioni meteorologiche fatte nell' anno 1888 all' Osservatorio della R. Università di Torino.

63, *Victoria Street*, May 21, 1890.

PRESENT :

LIEUT.-GENERAL STRACHEY IN THE CHAIR.

MR. BUCHAN.
PROFESSOR DARWIN.

MR. GALTON.
MR. STONE.

The Secretary was in attendance.

The Minutes of the last meeting (May 7) were read and confirmed.

The draft of the Annual Report (Minutes, p. 8) was further considered.

Read—The following letter (Minutes, p. 2):—

(M.O. 887.)

DEAR SIR,

West End, Esher, May 12th, 1890.

WITH reference to the experiments which have been made on wind pressure, I find that my contract for the hiring of the steam engine expires this month, and I shall be glad if you will lay the question of removing it before the Meteorological Council. At the present time experiments have been made on all the points mentioned in Professor Darwin's memorandum, excepting those relating to curved surfaces, and in addition a determination of the form of the stream lines on both the back and front surfaces of the plate when exposed at various angles, viz., 0°, 15°, 30°, 45°, 60°, and 75° has been made. Also the departures from the mean pressure at the back and front of the plate, when exposed, normally, have been determined for various velocities.

I had hoped to have sent you the report before now, but owing to illness I have hardly been able to do anything in the matter for the last month or six weeks, hence the delay.

The expenses up to the present time come to about 10*l.* or 12*l.*; a detailed account shall be sent with the report.

If it is considered desirable to make further experiments, I hope that I might be able to do so. I may be away from home for June and July, and possibly August, but could probably arrange to have the engine left where it is for a small sum on the chance of my wanting it again.

Yours, &c.

(Signed) W. H. DINES.

R. H. Scott, Esq., F.R.S.

Mr. Scott stated that he had requested Mr. Dines (P.C. 920) to keep on the steam engine till further orders.—Approved.

Read—A letter from Mr. Baillie stating that since last meeting four logs had been received, three of them being "excellent." Mr. Scott was instructed to present the charts (O. 27) to Captain O. E. Anderson, and to convey the best thanks of the Council to the other two observers.

Submitted—The following report on the 8.30 p.m. forecasts for April 1890 :—

The letters used have the following signification :—

a=complete success.

b=partial (i.e. more than half) success.

c=partial failure.

d=total failure.

DISTRICTS.		Per-centages.			Per-centage of Success. a + b.
		Wind.	Weather.	Average Forecast.	
SCOTLAND, N.	a	40	57	49	82
"	b	44	23	33	
"	c	13	17	15	
"	d	3	3	3	
SCOTLAND, E.	a	44	60	52	87
"	b	43	27	35	
"	c	7	7	7	
"	d	6	6	6	
ENGLAND, N.E.	a	47	53	50	85
"	b	33	37	35	
"	c	20	0	10	
"	d	0	10	5	
ENGLAND, E.	a	63	63	63	90
"	b	27	27	27	
"	c	10	3	7	
"	d	0	7	3	
MIDLAND COUNTIES	a	53	60	57	90
"	b	30	37	33	
"	c	10	0	5	
"	d	7	3	5	
ENGLAND, S.	a	60	60	60	92
"	b	30	33	32	
"	c	10	0	5	
"	d	0	7	3	
SCOTLAND, W.	a	44	43	44	80
"	b	33	40	36	
"	c	13	10	12	
"	d	10	7	8	
ENGLAND, N.W.	a	37	37	37	82
"	b	40	50	45	
"	c	20	13	17	
"	d	3	0	1	
ENGLAND, S.W.	a	50	57	54	91
"	b	37	37	37	
"	c	10	3	6	
"	d	3	3	3	
IRELAND, N.	a	27	57	42	76
"	b	40	27	34	
"	c	27	13	20	
"	d	6	3	4	
IRELAND, S.	a	30	47	39	74
"	b	30	40	35	
"	c	30	10	20	
"	d	10	3	6	
SUMMARY.					
BRITISH ISLES	a	45	54	50	84
"	b	35	34	34	
"	c	16	7	12	
"	d	4	5	4	

Submitted the following Provisional Report (Minutes, p. 1) :—

MEMORANDUM on the RESULTS obtained from SPECIAL TRIALS made to ascertain to what extent the ANALYSIS of the BAROGRAMS and THERMOGRAMS made with the HARMONIC ANALYSER may be relied upon as correct.

THE object of these experiments has been to find out how far the actual readings obtained from the harmonic analyser may be relied upon as correct, and to ascertain something of the nature and magnitude of the errors which may be expected to exist in them.

It should be said that at present the only available check upon this portion of the work is to compare the monthly results obtained from cylinder 7 (the mean) with the arithmetical means already obtained from the hourly measurements of the curves. But it is obvious that for the readings of the other six cylinders this test can only be one of the most general character; while as applied to cylinder 7 itself it is by no means so satisfactory as one could wish, since, as these experiments show, the differences between the increments yielded by two tracings of the same curves are often greater than the increments themselves.

The insufficiency of this test has been further shown by these experiments, in having disclosed two important errors in the original operation which the comparison failed to reveal, and which nothing short of re-analysing the curves could be expected to show.

In both instances a temperature curve for one day was passed twice through the machine, and necessarily on both occasions another curve must have been omitted altogether, otherwise the error would have been detected; yet although the error extended in each instance over several days, both escaped detection on comparison with the monthly mean. It is perfectly easy to account for the occurrence of such accidents as these, and bearing in mind the many ways in which they could happen, I think it by no means unlikely that in so large a piece of work as the analysis of the thermograms and barograms, which extends over 12 years records, and involves dealing with an aggregate of upwards of 61,300 day's traces, many of them may exist. It is therefore important to remember that for their detection the comparison of the mechanically and arithmetically derived means is not likely to be of much use.

In the present experiments the thermograms and barograms for Valencia for the year 1877 were again passed through the machine, using the same data for the setting of the machine as on the first occasion, but in order to guard against the possibility of bias in any direction, not allowing the operator to see any of the original results during the progress of the work. The year 1877 was selected for no other reason than that it was about the middle of the series of years dealt with, and therefore likely to represent a fair average of the work; but it was a good year to select for the purpose in view for this further reason that it embraced very few cases of defective photography, and those only for short intervals, and therefore the chance that differences would arise from this cause in the way alluded to later on, was very small.

THERMOGRAMS.

Cylinder 7 (mean).—The readings on this cylinder all through the operation were higher than on the first occasion, and the final reading at the close of the year was $+53.685$ instead of $+48.358$, a difference of 5.327 turns of the cylinder. As, however, we deal with *daily* means, these numbers have to be divided by the number of days in the period, and doing this we get a difference of 0.11 in the mean daily temperature for the year.

In the mean daily temperature obtained from the *monthly* increments we find larger differences between the two operations :—

January = $+0.3$; February, $+0.25$; March, $+0.21$; April, $+0.04$; May, $+0.02$;
June, $+0.02$; July, $+0.02$; August, -0.005 ; September, $+0.07$; October, $+0.06$;
November, $+0.12$; December, $+0.18$.

It is worth noting here that the differences are large only in the winter months, from April to October they are insignificant, and in August the very trifling difference shown has a minus instead of a plus sign.

The largest differences are of course found between the readings for single days, and the largest of these amounts to 0.65 ; the extreme *range* of the differences (from largest $+$ to largest $-$) amounted to 1.2 .

I think these differences are entirely due to the way in which the curves were traced by the operator on the two occasions, and not to any error in the "setting" of the instrument. Every care was taken to set the ball correctly upon the disc, and if any error had been made here it would have been the same thing as taking an incorrect value for the centre of the disc, which would have given an error constant in sign and amount throughout, which is not what we get.

But to test this point the month of January was passed through the machine a third time, after I had myself examined it to see that the adjustments were good, the zero pointers being then shifted so that an entirely fresh start should be made, as before. In this case the increments were nearly all smaller than in the second operation, though still larger than in the first, the mean daily temperature being 0.13 lower than the one and 0.17 higher than the other, a result which I think bears out my suggestion; as I explain further on, the exigencies of the machine makes it a difficult task to pass a curve such as a thermogram twice through with exactly the same result.

Cylinders 1 and 2.—In the case of these cylinders the differences were small, the increments being themselves usually very slight; but relatively to the latter they were sometimes considerable, and occasionally as large as the increment itself. The final reading at the close of the operation gave a difference in the daily mean for the year of only -0.03 in a_1 and of $+0.04$ in b_1 but as

will be seen from the table appended, the daily differences for the months were larger. It is to be noted, however, that the differences varied a good deal in sign, and so tended to cancel each other in the mean.

Some very large differences were found upon examination to be due to the accidental omission of a curve, as already explained.

Cylinders 3, 4, 5, and 6.—Here again the differences are only considerable when they are compared with the size of the increments themselves. The mean daily differences for the year are, in the case of each cylinder, insignificant, but for the month they are sometimes larger. These cylinders were only read at the end of each five days, and it is of course with those readings that the largest differences occur, as, for example, at the close of the first five-day period, when we have—

Cylinder	-	3.		4.		5.		6.
Reading -	-	·020	-	·065	-	·016	-	·100.
Difference	-	·015	-	·022	-	·018	-	·010.

the difference on cylinder 4 being equal to $0^{\circ} \cdot 13$.

BAROGRAMS.

Cylinder 7 (mean).—The difference between the mean daily pressure for the year, obtained from the final readings of the two operations, is insignificant, but in the daily means for the months the differences are larger, and vary from $+\cdot 002$ to $-\cdot 004$ inch. The largest difference between the two readings for any one day is equal to $\cdot 026$ inch, and these daily differences range from $+\cdot 026$ to $-\cdot 017$ inch. Taking the daily readings of this cylinder as a whole, the differences appear large relatively to the size of the increments, but owing to their constant change of sign they tend to cancel each other as the period over which the mean is taken is lengthened.

Cylinders 1 to 6.—The results here seem to be very similar to those obtained from the re-analysis of the thermograms, and although the differences are all small, yet they frequently bear a considerable proportion to the increments themselves. It is noticeable that there is no indication of any bias on the part of the operator in any one direction, and from this I conclude that the differences indicate fairly the limits within which a set of barograms may be expected upon re-analysis to yield the same results.

In passing a curve through the machine two things have to be attended to: first, the zero line of the curve has to be made to conform to a *fixed* pointer at one end of the cylinder over which the curve is fed; and secondly, a *movable* pointer has to be made to travel over the edge of the trace itself.

In the case of a thermogram the zero is supposed to be a straight line, but practically it is seldom so, owing to an unequal shrinking which occurs in the sheets in drying after completing the photographic process, and which causes a certain amount of curvature in the line known as “bagging.” The amount of bagging varies a good deal, sometimes it is very trifling and sometimes considerable.

The zero line of a barogram is the “temperature edge” of the curve, and is not supposed to be straight but to vary with the temperature, owing to the action of the temperature compensation-arrangement of the barograph. In addition to this the curves “bag,” as do the thermograms.

The difficulty in dealing with the curves in the harmonic analyser lies in having to keep the two pointers correctly placed at one and the same time. If the zero pointer gets off the line it can only be set right by shifting the sheet, and this has to be done so that it shall then be fed into the machine in such a way that the line shall keep under the pointer for as much of the curve as possible. In doing this there is no room for previous trial as to the effect of the shift before actual working, and although with practice the operator is able to manipulate the sheets in the machine with a good deal of skill, yet it is clear that he cannot always be right, and in any case if the bagging is great the changes have to be frequently made. Besides this there is the risk of his getting considerably off the line before noticing it when his attention is mainly given to following the deviations of the trace with the movable pointer.

It seems to me that here is the weak spot in the machine as we use it. The machine itself leaves little to be desired as regards accuracy of working, as was sufficiently proved long since by the zigzag curves suggested by Prof. Stokes, in which with ordinary care there was no room for error on the part of the operator. The errors now dealt with arise almost solely from the difficulty of following with the necessary accuracy the edges of the traces, and in the difficulty, almost an impossibility, of ensuring that *both* pointers shall fulfil their functions correctly and continuously lies the chief cause of the differences obtained in passing the same curve twice through the machine.

Another cause of error operating in a similar way is bad photography, since when the curve is very indistinct, it is sometimes impossible to ensure that it shall be followed twice in exactly the same way, and there is always more or less guessing as to what the curve really is.

In addition to this there is the danger of mistake in putting the curves into the machine, the wrong curve may be taken up, or a sheet already in the machine may be used a second time.

And finally, there is the danger of error arising from incorrect reading of the cylinders, or of error in recording the readings upon the sheets.

For errors arising from any of these causes the only checks available, without re-working, are the comparison of the results obtained from cylinder 7 with the arithmetical means, and such check as may be applied by an examination of the readings *inter se*.

R. H. Scott, Esq., F.R.S.

(Signed) R. H. CURTIS,

April 22, 1890.

VALENCIA, 1877.

BAROMETER.

Month.	Trial.	First Order.		Second Order.		Third Order.		Mean.
		a_1 .	b_1 .	a_2 .	b_2 .	a_3 .	b_3 .	a_0 .
JANUARY	1st	+0.0047	-0.0377	+0.0055	-0.0101	-0.0006	-0.0007	29.635
	2nd	+0.0048	-0.0369	+0.0064	-0.0101	-0.0008	-0.0008	29.631
FEBRUARY	1st	-0.0047	-0.0068	+0.0052	-0.0036	-0.0018	-0.0006	29.992
	2nd	-0.0044	-0.0078	+0.0057	-0.0032	-0.0020	-0.0003	29.991
MARCH	1st	+0.0086	-0.0109	+0.0074	-0.0033	-0.0010	+0.0011	29.794
	2nd	+0.0078	-0.0096	+0.0082	-0.0039	-0.0022	+0.0015	29.793
APRIL	1st	-0.0008	-0.0042	+0.0056	-0.0017	0.0000	-0.0017	29.608
	2nd	-0.0018	-0.0044	+0.0059	-0.0022	-0.0001	-0.0015	29.610
MAY	1st	-0.0010	+0.0031	+0.0055	+0.0038	+0.0013	+0.0021	29.810
	2nd	-0.0008	+0.0026	+0.0062	+0.0031	+0.0003	+0.0019	29.808
JUNE	1st	-0.0075	-0.0153	+0.0073	-0.0096	+0.0020	-0.0059	29.913
	2nd	-0.0078	-0.0153	+0.0079	-0.0099	+0.0012	-0.0055	29.911
JULY	1st	+0.0016	-0.0068	+0.0048	-0.0020	+0.0018	-0.0011	29.913
	2nd	+0.0016	-0.0068	+0.0059	-0.0025	+0.0013	-0.0012	29.912
AUGUST	1st	-0.0091	-0.0091	+0.0057	-0.0027	+0.0018	-0.0016	29.784
	2nd	-0.0094	-0.0091	+0.0055	-0.0029	+0.0009	-0.0009	29.786
SEPTEMBER	1st	+0.0008	+0.0070	+0.0098	-0.0034	+0.0019	+0.0011	30.048
	2nd	+0.0008	+0.0058	+0.0098	-0.0043	+0.0013	+0.0014	30.049
OCTOBER	1st	-0.0018	-0.0060	+0.0073	-0.0098	-0.0010	+0.0028	29.895
	2nd	-0.0023	-0.0065	+0.0063	-0.0095	-0.0009	+0.0023	29.897
NOVEMBER	1st	+0.0117	+0.0289	+0.0092	-0.0022	0.0000	+0.0073	29.546
	2nd	+0.0117	+0.0286	+0.0091	-0.0018	-0.0006	+0.0073	29.548
DECEMBER	1st	-0.0014	-0.0138	+0.0048	-0.0090	-0.0022	+0.0008	30.010
	2nd	-0.0013	-0.0153	+0.0054	-0.0092	-0.0028	+0.0001	30.009

TEMPERATURE.

JANUARY	1st	-0.86	-0.12	+0.34	+0.42	-0.08	-0.15	46.63
	2nd	-0.86	-0.08	+0.38	+0.40	-0.07	-0.13	46.92
	3rd	-0.89	-0.07	+0.38	+0.39	-0.07	-0.14	46.79
FEBRUARY	1st	-0.71	-0.48	+0.29	+0.32	0.00	-0.13	47.50
	2nd	-0.76	-0.47	+0.31	+0.29	+0.01	-0.13	47.74
MARCH	1st	-1.82	-1.26	+0.39	+0.65	+0.01	+0.20	45.41
	2nd	-1.85	-1.30	+0.41	+0.66	+0.01	+0.18	45.62
APRIL	1st	-1.85	-1.72	+0.42	+0.50	+0.08	+0.18	48.59
	2nd	-1.94	-1.77	+0.45	+0.51	+0.11	+0.18	48.64
MAY	1st	-3.14	-2.51	+0.17	+0.11	+0.24	+0.49	51.12
	2nd	-3.02	-2.46	+0.19	+0.12	+0.27	+0.47	51.15
JUNE	1st	-2.74	-1.69	+0.20	+0.22	+0.10	+0.20	57.34
	2nd	-2.74	-1.81	+0.20	+0.25	+0.10	+0.16	57.37
JULY	1st	-2.06	-1.23	+0.16	+0.28	+0.15	+0.15	57.58
	2nd	-2.10	-1.31	+0.18	+0.29	+0.17	+0.13	57.61
AUGUST	1st	-2.22	-1.27	+0.27	+0.41	+0.11	+0.30	58.47
	2nd	-2.26	-1.43	+0.29	+0.41	+0.08	+0.29	58.47
SEPTEMBER	1st	-2.77	-2.22	+0.48	+0.86	+0.13	+0.23	54.95
	2nd	-2.80	-2.32	+0.48	+0.86	+0.12	+0.22	55.02
OCTOBER	1st	-1.52	-0.86	+0.67	+0.50	-0.08	+0.02	53.76
	2nd	-1.57	-0.89	+0.68	+0.51	-0.06	+0.02	53.82
NOVEMBER	1st	-0.82	-0.38	+0.45	+0.46	-0.12	+0.08	48.52
	2nd	-0.83	-0.40	+0.47	+0.45	-0.13	+0.07	48.64
DECEMBER	1st	-0.70	-0.44	+0.50	+0.36	-0.10	-0.30	47.07
	2nd	-0.65	-0.42	+0.45	+0.33	-0.10	-0.29	47.25

The Council again considered the memorandum on the harmonic analyser by Professor Darwin (Minutes, 1889, p. 91), and the foregoing memorandum on the results of the fresh tests applied to the working of the instrument under the instruction of the Council.

As to the past use of the analyser, it appeared that its original construction was undertaken as an experiment which it appeared desirable to make, with a view of ascertaining whether it might not be possible to substitute its use, with economy of time and expense, and without loss of accuracy, for the usual arithmetical process of computation. The earliest continued use of the machine, the results of which were published in the Appendix to Part 2 of the Quarterly Weather Report for 1876 (published 1883), was tentative, and was applied to the calculation of the harmonic constants of temperature for the year 1876 (erroneously stated to be 1874 in the Report, p. [39]), at each of the seven self-recording observatories, viz., Valencia, Armagh, Glasgow, Aberdeen, Falmouth, Stonyhurst, and Kew. The numerical values of the mean hourly temperatures for each month had been calculated by Mr. Eaton for that year, and the comparison of the arithmetical computations with the machine results was rendered possible, which for other years could not have been undertaken without the previous calculation of the monthly mean hourly values, which the Meteorological Office had not then attempted.

The conclusions at that time drawn from this experiment are thus stated in the report drawn up in the Office, and found at p. [41.] of the volume above named:—

“Disregarding now the systematic character of some of the errors, and treating them as purely casual, we get as the average difference between the constants as got by the machine and by calculation from the 24 hourly means, $0\cdot065$. It may be noticed, however, that the numbers are unusually large (and at the same time very decidedly systematic) in the case of the second cylinder of the first order, for which the average is as much as $0\cdot125$, the eighth of a degree. If b be omitted, the average for the remaining cylinders of the machine is reduced to $0\cdot047$.

“We see, therefore, that with the exception perhaps of b , the constants got by the machine for the mean of the days constituting a month, are as accurate as those got by calculation, which requires considerably more time, inasmuch as the hourly lines have to be drawn on the photograms, then measured, then meaned, and the constants deduced from the means by a numerical process by no means very short.”

From these remarks it will be seen that the idea was then entertained of obtaining the harmonic constants *without measuring the photographic traces or obtaining by calculation mean values for the several hours*, and that the results obtained by the machine were regarded as satisfactory.

While these preliminary trials were being carried on, General Strachey had been computing the harmonic coefficients of the entire series of barometric and thermometric observations at Greenwich for the 20 years between 1849 and 1868, and being desirous of obtaining more complete means for comparison with the data thus obtained, he considered that the satisfactory results of the treatment of the photographs of 1876 justified the extension of the use of the machine to the whole series of records of the self-registering observatories, which in the absence of computed hourly mean values could not be dealt with.

In an appendix to the volume of Hourly Readings for 1883, published in 1886, were given the harmonic constants obtained by the machine for the seven observatories before named for the temperature for each month of each of the 12 years, from 1871 to 1882. Table III. of these results gives comparison of the mean temperatures obtained for each month and each year, for each of the stations, by the machine, and by arithmetical computation from the measurements of the curves; but as the mean hourly values had not been obtained by computation from the measurements, no comparison of the harmonic constants was then possible. Such explanations of the discrepancies between the computed and machine mean monthly values as could be given will be found annexed to the tables, and it will be seen that irregularities and uncertainties were found in the measurements, to which a considerable part of the discrepancies between values obtained by calculation and by the machine was attributed. Subsequently the barometric curves were all dealt with in a similar manner, and the results are now available for publication.

While this treatment of the photographs by means of the machine was in progress, the Council resolved to undertake the computation of the hourly mean values for the whole series of observations, and this is now going on. When it is completed for any period the arithmetical computation of the harmonic coefficients will become possible, and the question has to be considered whether, so long as the measurement and tabulation of the values obtained from the photographs is continued,

and their mean values are computed, it is desirable to continue the use of the machine in preference to a system of arithmetical computation for the purpose of obtaining the harmonic elements.

The latest examination of the results of working the machine by repeating the measurements for Valencia for the year 1877 do not appear materially to alter facts as they were indicated in the previous trials. The difficulty in passing the photographs through the machine with complete precision, in respect to the tracing point following the curve, and to simultaneously preserving the true position of the zero line, for securing which the machine provides no sufficient means, is more fully pointed out, and the risk of absolute errors by omission of an entire daily curve is likewise made apparent. Moreover, the impossibility of obtaining any real independent check on the accuracy of the work without a complete repetition of the whole process is obvious. At the same time, the excellence of the workmanship of the machine is fully established by the very close correspondence of the results of a repetition of the process, when viewed in relation to the whole series of values obtained.

There appears to be sufficient ground for continuing to obtain by measurement from the photographs the hourly values of the principal meteorological phenomena, and to compute and publish the hourly numerical means. This being the case, it can hardly be questioned that the arithmetical treatment of the data for the purpose of obtaining the harmonic coefficients will then be less laborious and more satisfactory, as being much more readily susceptible of check, than treatment by the machine.

The Council are convinced of the great importance of continuing the harmonic analyses of the curves which represent the chief meteorological phenomena, and they consequently resolve that this process shall henceforth be regarded as an essential part of the treatment of the data, and shall invariably follow the computation of the requisite mean values.

The Council remark in conclusion that, although for the purposes above referred to the harmonic analyser will not be employed, there are occasions on which its use may be found very convenient, and it will be desirable that some one at least of the assistants shall be trained to its use, and that care shall be taken that it is kept in proper order.

Mr. Scott stated that the demands from the dockyards had been unusually heavy in the present season, and he requested the Council for permission to order more instruments as under :—

MEMORANDUM.

The following instruments will be required for stock :—

“ A ” Account.

			£	s.	d.
25 Marine Barometers, estimated cost	-	-	112	0	0
25 Aneroids -	-	-	60	0	0
200 Thermometers -	-	-	77	0	0
50 Maximum Thermometers	-	-	65	0	0
50 Minimum	-	-			
50 Screens	-	-	30	0	0

(Signed) R. STRACHAN,
May 20th, 1890.

—Approved.

Submitted—The following list of publications which had been received since the last meeting :—

Haldane, J. S., and Pembrey, M. S.—An improved method of determining moisture and carbonic acid in the air.

Hands & Co.—Illustrated catalogue of lightning conductors.

Weihrauch, K.—Forsetzung der neuen Untersuchungen über die Bessel'sche Formel und deren Verwendung in der Meteorologie.

Sresnewskij, B.—Über Schneeverwehungen auf den Eisenbahnen in Russland.

London, British Association.—Report, 1889.

Juhlin, J.—Sur la température nocturne de l'air à différentes hauteurs.

Rio de Janeiro, Observatorio Meteorologico da Reparticao dos Telegrafos do Brasil.—Boletins mensaes. Vol. iii., 1888.

63, *Victoria Street*, June 4, 1890.

PRESENT:

LIEUT.-GENERAL STRACHEY IN THE CHAIR.

PROFESSOR DARWIN.
MR. GALTON.

MR. STONE.
THE HYDROGRAPHER.

The Secretary was in attendance.

The Minutes of the last meeting (May 21) were read and confirmed.

The draft Report of the Council for the year 1889-90 was again submitted (Minutes, p. 15), and approved. The Secretary was instructed to forward it to the Royal Society. (P.C. 1136.)

Read—Letter 1012 from Mr. Dines (Minutes, p. 15), accompanying his report on anemometrical experiments. Mr. Darwin was requested to examine the report, and if he approved of it, to communicate it to the Royal Society in the name of the Council.

Read—The following letter :—

(M.O. 954.)

DEAR MR. SCOTT.

The Royal Society, Burlington House,
London, W., May 23rd, 1890.

I AM directed by the President and Council of the Royal Society to ask that the Meteorological Council will be so good as to advise them upon the recommendation of the Government Grant Committee referring to an application of Professor Grant of Glasgow.

I enclose copies of the recommendation in question, and also of Professor Grant's application.

R. H. Scott, Esq.

Yours very truly,
(Signed) M. FOSTER.

1. R. Grant—for Publication of the Results deducible from Meteorological Observations made at the Glasgow Observatory with self-recording instruments during the years 1868-87...300.

With reference to Application 1 (R. Grant) it appears that a large part, at all events, of the Glasgow Meteorological Observations are now being dealt with by the Meteorological Office, and that a complete discussion of the observations for twelve years of barometric pressure and air temperature is contemplated in connection with the similar records obtained at the other self-registering observatories supported by the Meteorological Office. Board B, therefore, hesitate to recommend a grant for the separate publication of the whole of the Glasgow Observations, as proposed by Professor Grant, and suggest that the Meteorological Council might be requested to advise the Council of the Royal Society on the subject generally before any further action is taken.

The Secretary was instructed to send the following reply :—

(954.)

DEAR PROFESSOR FOSTER,

Meteorological Office, June 5th, 1890.

WITH reference to your letter of the 23rd ultimo, I am directed by the Meteorological Council to inform you that they have already published in various forms a considerable part of the meteorological observations made at the Glasgow Observatory, between the years 1869 and 1883, as shown in the annexed memorandum.

They further have taken in hand the discussion and publication, in as great degree as they think desirable, of the Glasgow observations in common with those made at the other self-recording observatories that were maintained by the Council between 1869 and 1883.

They, therefore, are unable to advise the Council of the Royal Society to take part in the publication of the results which will be dealt with by the Meteorological Office.

As to the years which are not embraced in the period to be dealt with by the Meteorological Office, and the results other than those which the Meteorological Office will publish, the Meteorological Council have no reason to doubt the value of the discussions proposed by Professor Grant, and the Council of the Royal Society may without objection, in the opinion of the Meteorological Council, deal with the question of a grant in aid of their publication according to any principle that the Government Grant Committee may adopt.

Prof. M. Foster, M.D., F.R.S.,
Secretary, Royal Society.

Yours faithfully,
(Signed) ROBERT H. SCOTT,
Secretary, Meteorological Council.

Read—A letter from Mr. Baillie stating that since last meeting ten logs had been received, five of them being excellent. Mr. Scott was instructed to present the charts (O. 27) to Captain Streater, and to convey the best thanks of the Council to the other observers.

Submitted—The following statements of work for May 1890 :—

MARINE BRANCH.

June 3rd, 1890.

Examined 10 new logs, and 1 lighthouse register.

Discussion of the observations in the district between the Cape of Good Hope and New Zealand.

Advancing the completion of the charts of Red Sea data.

Discussion of sea temperature, &c. round Cape Guardafui, and adding marginal notes giving the principal features of each month.

Charting ocean currents from the Remark Books of H.M. ships. 481 volumes were received from the Hydrographic Department during the month.

(Signed) CHAS. HARDING.

The Marine Superintendent.

Forwarded for the information of the Council.

(Signed) C. W. BAILLIE.

TELEGRAPHIC (FORECAST AND STORM WARNING) BRANCH.

(To 31st May 1890.)

Monthly Weather Report, 1887.—May and June in proof; July and August in printer's hands; September more than half done.

Monthly Summaries, 1888.—All numbers up to September printed and issued. October and November completed; copies expected daily. December and title-page being revised.

Weekly Weather Report, 1890.—All numbers issued promptly to date. *Monthly Summaries*, January to March, completed. April half done.

Daily Weather Reports, 1890.—All issued to date. "Correction and Addition" sheet for April issued.

Checking Daily Forecasts, 1890.—Nearly up to date (delayed by storm warning checking).

Checking Storm Warnings, 1889.—About half done.

Quarterly Weather Report, 1880.—Tables of Mean Values for Telegraphic Reporting Stations, for third quarter, done.

(Signed) FREDC. GASTER.

PANTAGRAPH ROOM.

June 2nd, 1890.

The calculation of the various means required for the new series of "Hourly Readings" is still in hand. The whole of the means for five-day periods have now been worked and checked, and those for the months and year are in hand.

Quarterly Weather Report.—The proof of letterpress and plates for Part II., 1880, has been finally revised, and signed for press. The chart plates for Part III., 1880, are finished and at the lithographer's.

Miscellaneous.—The comparison of the curves yielded by the electrical anemometer at Kew with those of the ordinary instrument has been kept up to date; and various reports, &c. have been prepared during the month, in addition to keeping the usual routine work of the room from falling into arrear.

(Signed) R. H. CURTIS.

R. H. Scott, Esq., F.R.S.

EXAMINATION BRANCH.

June 2nd, 1890.

Examinations.

April 1890.—Completed.

Weekly examination (on receipt) of curves and documents from all observatories.

Reports, &c.

March and April, 1890.—Copies of the "Notes of Errors" to all observatories.

General.

Computations *re* the hourly fall of rain at the seven observatories, 1881 and 1882. Messrs. Parsons and Hewitt have also been engaged on various other duties during the month, including the changing of the notice boards on balcony (twice daily), delivery of the Daily Weather Reports, &c.

(Signed) T. E. ALLEN.

Submitted—The following list of publications which had been received since the last meeting :—

Emden, Naturforschende Gesellschaft.—74 Jahresbericht pro 1888–89.

Cracow, C. K. Akademii Umiejetności w Krakowie.—Materyjaly do klimatografii Galicyi zebrane przez sekeyę meteorologiczną komisyi fizyograficznej. 1889.

Süring, R. J.—Die vertikale Temperaturabnahme in Gebirgsgegenden in ihrer Abhängigkeit von der Bewölkung.

Bombay, Meteorological Office.—Brief sketch of the meteorology of the Bombay Presidency in 1888–89.

Tokio, Meteorological Central Observatory.—Notice. Cautionary Signals.

Trabert, W.—Täglicher Gang von Luftdruck und Lufttemperatur an einigen Stationen der deutschen Schutzgebiete im äquatorischen Afrika und in Neu Guinea.

63, Victoria Street, June 25, 1890.

PRESENT :

LIEUT.-GENERAL STRACHEY IN THE CHAIR.

MR. BUCHAN.
PROFESSOR DARWIN.

MR. GALTON.
THE HYDROGRAPHER.

The Secretary was in attendance.

The Minutes of the last meeting (June 4) were read and confirmed.

Read—The following letter :—

(M.O. 1091.)

DEAR SIR,

West End, Esher, June 14, 1890.

I INCLOSE an account of the expenses incurred in connexion with the wind-pressure experiments.

As you are no doubt aware, I have been asked by the Council of the Meteorological Society to make a direct and simultaneous comparison of various anemometers, and it was suggested that I should apply to the Meteorological Council for a grant for the purpose. On thinking over the matter, it appears to me that there would be considerable difficulty, more especially in finding a suitable locality for the experiments, and also I am quite uncertain as to the probable amount of the expense; but the comparison would probably afford valuable information on the subject of anemometry in general, and I should be quite willing to devote my spare time to the investigation, should the Meteorological Council think it a desirable one.

The steam engine is still standing at Hersham, but I am not paying for it. The owners have left it for a few weeks, to see whether I am likely to want it again.

Yours, &c.

(Signed) W. H. DINES.

R. H. Scott, Esq.

Mr. Scott was instructed to reply (P.C. 1185) that the Council would be ready to assist Mr. Dines in the proposed experiments, provided that the report of the results be made to them, and they would authorise Mr. Dines to draw upon them to the extent of 50

With reference to the electrical anemometer (Minutes, p. 12), Mr. Scott was instructed to write to the Knight of Kerry (P.C. 1203) terminating the tenure of Kilbeg Hill at the earliest date allowable, and to inform the Post Office of this action.

Read—A letter (No. 1140) from Dr. Meldrum, stating that he would be glad to receive 250 copies of his charts of cyclone tracks (Minutes, 1889, p. 9). It was resolved that 100 copies be supplied out of the Office stock, and that the remainder be purchased from the Stationery Office.

Read—Letters 1132 and 1148 from Mr. W. B. Tripp, C.E., accompanying certain charts of rainfall and of its variation from the average over the globe, and requesting assistance towards their publication.

Mr. Scott was instructed to reply (P.C. 1192) that the Council regretted that they were obliged to consider Mr. Tripp's investigations as outside their sphere of action.

Submitted—The following report on the 8.30 p.m. forecasts for May 1890 :—

The letters used have the following signification :—

a=complete success.

b=partial (*i.e.*, more than half) success.

c=partial failure.

d=total failure.

MAY.

DISTRICTS.		Percentages.			Percentage of Success. a + b.
		Wind.	Weather.	Average Forecast.	
SCOTLAND, N.	a	52	52	52	88
"	b	39	32	36	
"	c	3	3	3	
"	d	6	13	9	
SCOTLAND, E.	a	58	52	55	86
"	b	36	26	31	
"	c	6	3	5	
"	d	0	19	9	
ENGLAND, N.E.	a	42	42	42	71
"	b	29	29	29	
"	c	23	13	18	
"	d	6	16	11	
ENGLAND, E.	a	29	49	39	67
"	b	39	16	28	
"	c	16	16	16	
"	d	16	19	17	
MIDLAND COUNTIES	a	45	45	45	76
"	b	32	29	31	
"	c	16	20	18	
"	d	7	6	6	
ENGLAND, S.	a	52	45	49	73
"	b	19	29	24	
"	c	16	20	18	
"	d	13	6	9	
SCOTLAND, W.	a	71	52	62	81
"	b	20	19	19	
"	c	6	13	10	
"	d	3	16	9	
ENGLAND, N.W.	a	55	45	50	81
"	b	32	29	31	
"	c	10	10	10	
"	d	3	16	9	
ENGLAND, S.W.	a	42	58	50	73
"	b	29	16	23	
"	c	19	13	16	
"	d	10	13	11	
IRELAND, N.	a	42	61	52	84
"	b	39	26	32	
"	c	13	3	8	
"	d	6	10	8	
IRELAND, S.	a	45	65	55	75
"	b	26	13	20	
"	c	6	9	7	
"	d	23	13	18	
SUMMARY.					
BRITISH ISLES	a	49	52	51	78
"	b	31	24	27	
"	c	12	11	12	
"	d	8	13	10	

Read—A memorandum stating that since last meeting 14 logs had been received, 7 of them being “excellent.” Mr. Scott was instructed to convey the best thanks of the Council to the observers.

Reported—That two small anemometers had been lent to Professor Philip Jenkins, for certain experiments on wind-pressure on ships’ sails (Letter 1121).—Approved.

Read—Letter 1085 from the Royal Meteorological Society, asking if the Council would grant 25% towards the cost of their inspections as in former years.—Approved (P.C. 1189).

Submitted—The following summary, as a result of the primary checking of the storm warnings issued to the coasts of the British Islands, since the last meeting of the Council :—

1. WARNINGS ISSUED.

SUMMARY.

A + B (successful)	-	-	-	-	-	= 7
C (unsuccessful)	-	-	-	-	-	= 4

2. GALES EXPERIENCED, BUT FOR WHICH NO WARNINGS WERE ISSUED.

None.

(Signed) FREDC. GASTER.

Telegraphic Branch,
25th June 1890.

Read—The following letters :—

(M.O. 1134.)

SIR,

Lloyd’s, E.C., 19th June 1890.

I HAVE the honour to inform you that, as you are no doubt aware, the Committee of Lloyd’s have signal stations at various points both in the United Kingdom and abroad. My Committee will be most happy to assist the Meteorological Office in any manner in their power in allowing observations to be taken at any of their signal stations, if so desired by the Meteorological Office

When new stations are being established it might be possible to arrange that these observations should be taken as a part of the signalman’s duty, and no payment made to the signalman for doing so. When stations have been established and signalmen engaged, it is not easy to throw extra duty on the man without giving him remuneration for it. At the present time my Committee contemplate the establishment of additional stations in the United Kingdom at Tory Island, Butt of Lewis, Cromer, Peterhead, St. Abb’s Head, and North Foreland, and would be glad if you would be so good as to allow me to be informed whether you would wish arrangements to be made for observations to be taken at any of these.

I am, &c.

(Signed) H. M. HOZIER,
Secretary.

The Secretary, Meteorological Office,
63, Victoria Street, S.W.

(M.O. 1135.)

SIR,

Lloyd’s, E.C., 20th June 1890.

I HAVE the honour to inform you that it has been suggested that it might be of advantage to the Mercantile Marine, and also to the fishing trade, if arrangements could be made by which the storm signals advised by the Meteorological Office could be shown at Lloyd’s signal stations, especially at such as are on far outlying points; and I should be accordingly grateful if you would be so good as to allow me to be informed whether arrangements could be made by which telegrams instructing the signalmen what signals to exhibit could be sent as necessary from the Meteorological Office to the signal stations where it might be considered desirable that these signals should be shown.

I am, &c.

(Signed) H. M. HOZIER,
Secretary.

The Secretary, Meteorological Office,
63, Victoria Street, S.W.

The subject of the proposed additional storm warning stations was referred to the Hydrographer.

Submitted—The following list of publications which had been received since the last meeting :—

Forstén, R.—Beiträge zur Kenntniss der oberen Luftströme.

Scott, R. H.—The variability of the temperature of the British Isles, 1869–1883, inclusive.

Ekholm, N.—Ueber die Einwirkung der ablenkenden Kraft der Erdrotation auf die Luftbewegung.

- Wollny, E.*—Forstlich-meteorologische Beobachtungen (Zweite Mittheilung).
Agamennone, G.—Sopra la correlazione dei terremoti con le perturbazioni magnetiche.
Tacchini, P.—Sopra un tromometro a registrazione fotografica.
Schück, A.—Neuere Kompassrosen, ihre Entwicklung, Grundzüge und Prüfung für den Gebrauchswert auf See.
Peck, C. E.—Meteorological Observations for the year 1884.
Avignon, Commission Météorologique du Département de Vaucluse.—Compte-Rendu. 1889.
Greenwich, Royal Observatory.—Report of the Astronomer Royal to the Board of Visitors. 1890.
Milan, R. Osservatorio Astronomico di Brera.—Osservazioni meteorologiche eseguite nell' anno 1889 da E. Pini.
Frankfurt am Main, Physikalischer Verein.—Jahresbericht für das Rechnungsjahr. 1888–89.
Madagascar, Observatoire Royal.—Résumé des observations météorologiques faites à Tananarive par le R. P. E. Colin. 1889.
Falmouth, R. Cornwall Polytechnic Society.—Annual report. 1889.
Cambridge (Mass.), Harvard College Observatory.—Annals, Vol. xxii. Meteorological observations made on the summit of Pike's Peak, Colorado, January 1874 to June 1888.
Ventosa, V.—Método para determinar la dirección del viento por las ondulaciones del borde de los astros.
Trinidad, Botanical Department.—Annual report. 1888.
Loanda, Observatorio Meteorológico.—Magnetismo terrestre. Declinação. 1881–1888.
Christiania, Den Norske Nordhavs-Expedition, 1876–1878.—XIX. Zoologi. Actinida ved D. C. Danielssen.
Washington, Smithsonian Institution.—Contributions to Knowledge, Vol. xxvi.

63, Victoria Street, July 16, 1890.

PRESENT ;

LIEUT.-GENERAL STRACHEY IN THE CHAIR.

MR. BUCHAN.
 PROFESSOR DARWIN.

MR. GALTON.
 MR. STONE.

THE HYDROGRAPHER.

The Secretary was in attendance.

The Minutes of the last meeting (June 25) were read and confirmed.

With reference to the letters from Lloyd's (Minutes, p. 26), Mr. Scott was directed to reply as under :—

Letter 1134 (Minutes, 1889, p. 34) :—

(P.C. 1339.)

SIR,

Meteorological Office, 17th July 1890.

IN reply to your letter of the 19th ultimo, I am instructed by the Council to thank you for your obliging offer to have observations taken at some of your signal stations.

As the station at Tory Island is not yet established, the Council do not contemplate making any arrangements at present to have observations taken there, and will still keep up the station at Malin Head.

As regards the proposed station at the North Foreland, the Council, as expressed in my letters of December 1, 1888, and July 19, 1889, are still desirous of establishing a station there, and will be glad to hear when you are ready to receive the instruments.

I am, &c.

(Signed) ROBERT H. SCOTT,
 Secretary.

The Secretary, Lloyd's, E.C.

Letter 1135, and Letter 1202 from the Hydrographer :—

(P.C. 1340.)

SIR,

Meteorological Office, July 17, 1890.

IN reply to your letter of the 20th ultimo, I am instructed by the Council to inform you that they will be very glad to avail themselves of your very kind offer to exhibit storm warnings to passing vessels at some of your signal stations.

The stations they would select as at present existing are—

Beachy Head.
St. Catherine's.
Prawle Point.
The Lizard.
Lundy Island.

Flamborough Head.
Malin Head.
The Old Head of Kinsale?
Browhead.
Dunnett Head.

Proposed stations :—

The North Foreland.
St. Abb's Head.
Sumburgh Head.

The only apparatus required is a canvas cone 3 feet in height and in diameter.

Printed instructions as to hoisting it will be supplied, and the warnings will be sent as soon as we hear the stations are ready.

I am, &c.

(Signed) ROBERT H. SCOTT,
Secretary.

The Secretary, Lloyd's, E.C.

Read—Letter 1246 from Mr. Dines, proposing a scheme for experiments on anemometers.

Mr. Dines was in attendance and explained his views, and he was authorized to proceed with the construction of the apparatus, as arranged at last meeting. The Council to be informed if a larger sum than 50*l.* was required (P.C. 1333).

Read—The following letter (Minutes, p. 12) :—

(M.O. 1168.)

SIR,

General Post Office, London,
26th June 1890.

WITH reference to your letter, M.O. 2551/88, of the 12th ultimo, on the subject of the agreement between the Meteorological Office and this Department, for the private wire between Valencia Observatory and Kilbeg Hill, I am directed by the Postmaster-General to inform you that, from inquiries which he has caused to be made, it would appear that the failure of the working of the anemometer has been due, not to any inherent defect in the apparatus, but rather to the manner in which it has been attempted to work it. In the circumstances of the case, however, Mr. Raikes is prepared to cancel the agreement on payment by the Meteorological Society (sic) of the sum of 6*l.*

I am, &c.

(Signed) J. C. LAMB.

The Secretary, The Meteorological Office.

Mr. Scott was directed to accept this proposal with thanks (P.C. 1344).

Read—Letter 1230 from Mr. Whipple, stating that the six months trial of the electrical anemograph had been completed.

Mr. Scott was instructed to direct him to dismount the instrument and store it at Kew (P.C. 1336).

Reported—That Mr. Baker had gone to Fort William, and that the instruments at the observatory had been erected.

The following report was submitted :—

REPORT to the METEOROLOGICAL COUNCIL regarding the ERECTION of their SELF-RECORDING INSTRUMENTS at the OBSERVATORY, FORT WILLIAM, SCOTLAND.

On June 23, 1890, I left Kew, having under my own personal care the barograph mercurial tube and the standard barometer for the eye observations, as well as the thermograph tubes and standard thermometers. The heavier portions of the various instruments had been carefully packed and forwarded by direction of the Superintendent of the Kew Observatory about two weeks previous to my departure, all of which reached their destination without damage; indeed, it is very gratifying to be able to report that notwithstanding the fragile nature of many of the instruments, they were all erected without any breakage whatever.

Fort William was reached on the afternoon of June 25, and Mr. Omond, the Superintendent of the observatory, met me at the pier. The building is quite a new one, and is situated on the

southern outskirts of the village of Fort William. The ground in the neighbourhood gradually slopes down to the shore of Loch Linnhe, which is some 100 yards distant to the westward of the observatory.

On my arrival I found that no preparations had been made for the erection of the instruments, neither was there any louvred screen constructed for the thermograph thermometers.

Having secured the services of the necessary workmen on the following day, operations were commenced, and the whole of the instruments were duly erected, and finally started for continuous registration on Monday morning, July 14th. Trial curves were obtained previously to this date, some of which are appended to this report.

The thermograph is fitted in an aperture opening on the north side of the building, with the thermometer bulbs about 4 feet 6 inches above the grass, the exposure being good on all sides. In the same room the barograph and standard barometer have been fixed. The rain-gauges (self-recording and spare gauge) are placed on the lawn in front of the house (west side), and are well exposed to the rain on all sides excepting the north-east.

The sun recorder is erected on a brick pier about 4 feet 6 inches from the ground in the best available position, but a range of hills on the opposite side of Loch Linnhe to the westward, varying in height from 5 to 10 degrees above the horizon, cuts off the evening sun at this time of the year at about 8 p.m., whereas to the east the hilltops vary from 12 degrees downwards, while to the north-east a small group of trees would probably obstruct the early morning sun, otherwise the exposure is good.

Mr. Omond was duly instructed in the photographic operations and also in the method of tabulating the various curves during my stay. As the tabulating scales supplied were all formerly in use at Armagh, the values afforded by them may not quite correspond with the true-scale readings of the instruments under their present conditions, therefore it would be well to check the scales as soon as a sufficient number of standard eye-observations have been taken.

The following are the corrections to the instruments at 62° Faht. :—

K.S. dry bulb 671	-	-	-	-	0° 0
" wet " 672	-	-	-	-	-0° 1
Max. N. and Z. M.O. 1,032	-	-	-	-	0° 0
Min. " " 1,322	-	-	-	-	0° 0
Barograph thermometer marked K.O. 6-90	-	-	-	-	-2° 0

The index correction to standard barometer, by Barrow and Co., London :—

M.O. 689	-	-	-	-	= + 0° 10 inch
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and attached thermometer—

K.O. 72222	-	-	-	-	= -0° 1
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The Beckley rain-gauge No. 51, by Hicks, London, requires a correction of - 0° 005 inch for every discharge of 0° 20 inch indicated on the curve.

(Signed) T. W. BAKER.

Kew Observatory,
July 25, 1890.

Submitted—The following summary, as a result of the primary checking of the storm warnings issued to the coasts of the British Islands since the last meeting of the Council :—

1. WARNINGS ISSUED.

SUMMARY.

A + B (successful)	-	-	=	6
C (failures)	-	-	=	8

2. GALES EXPERIENCED, BUT FOR WHICH NO WARNINGS WERE ISSUED.

A severe Westerly gale was felt in the extreme north of Scotland on the 25th June. The gale was occasioned by a depression which travelled across the north-west of Scotland on the night of the 24th. On the evening of that day the disturbance, which then lay to the north-west of Ireland, was of moderate depth, but in the course of the night it increased greatly in intensity, and by 8 a.m. next day the gale was already blowing.

Telegraphic Branch,
16th July 1890.

Read—Letter 1246 from Mr. Clement Ley, inquiring if the Council had any objection to his making certain suggestions as to weather telegraphy in a forthcoming work of his.

Mr. Scott was instructed to reply that the Council could have no objection to his dealing with the subject as he proposed (P.C. 1338).

The Chairman brought before the Council the subject of the arrangements (Minutes, 1876, p. 131), by which Kew observatory received 400% annually instead of 250%.

Mr. Scott was instructed to request Mr. Whipple to prepare a memorandum showing how the extra sum of 150% had been expended during the past two years (P.C. 1354).

Submitted—The following report on the 8.30 p.m. forecasts for June 1890 :—

The letters used have the following signification :—

a=complete success.

b=partial (i.e., more than half) success.

c=partial failure.

d=total failure.

DISTRICTS.		Percentages.			Percentage of Success. a + b.
		Wind	Weather.	Average Forecast.	
SCOTLAND, N.	a	43	50	47	80
"	b	27	40	33	
"	c	20	7	14	
"	d	10	3	6	
SCOTLAND, E.	a	40	70	55	79
"	b	33	14	24	
"	c	10	3	6	
"	d	17	13	15	
ENGLAND, N.E.	a	37	53	45	80
"	b	43	27	35	
"	c	17	10	14	
"	d	3	10	6	
ENGLAND, E.	a	43	47	45	80
"	b	37	33	35	
"	c	17	13	15	
"	d	3	7	5	
MIDLAND COUNTIES	a	57	47	52	82
"	b	30	30	30	
"	c	7	17	12	
"	d	6	6	6	
ENGLAND, S.	a	53	47	50	84
"	b	40	27	34	
"	c	7	20	13	
"	d	0	6	3	
SCOTLAND, W.	a	33	34	34	74
"	b	47	33	40	
"	c	10	20	15	
"	d	10	13	11	
ENGLAND, N.W.	a	47	43	45	75
"	b	30	30	30	
"	c	13	17	15	
"	d	10	10	10	
ENGLAND, S.W.	a	47	50	49	84
"	b	37	33	35	
"	c	6	10	8	
"	d	10	7	8	
IRELAND, N.	a	44	60	52	77
"	b	30	20	25	
"	c	13	7	10	
"	d	13	13	13	
IRELAND, S.	a	37	54	46	76
"	b	37	23	30	
"	c	16	10	13	
"	d	10	13	11	
SUMMARY.					
BRITISH ISLES	a	44	51	48	80
"	b	36	28	32	
"	c	12	12	12	
"	d	8	9	8	

Submitted—The following statements of work for June 1890 :—

MARINE BRANCH.

July 16th, 1890.

Examined 22 new logs.

Discussion of the observations in the district between the Cape of Good Hope and New Zealand.

Completing the monthly charts of sea temperature, &c. in the vicinity of Cape Guardafui. 12 charts sent to the lithographer for reproduction.

Charting ocean currents contained in the Remark Books of Her Majesty's ships. During the month 205 volumes were received from the Hydrographic Department.

Correcting proofs of "Instructions for keeping a Meteorological Log," and of lithographed charts of Indian Ocean cyclone tracks, of which 6 monthly and 15 annual (4 sheets) were received.

(Signed) CHAS. HARDING.

The Marine Superintendent.

TELEGRAPHIC (FORECAST AND STORM WARNING) BRANCH.

(To 30th June 1890.)

Monthly Weather Report, 1887.—May to July in proof; August and September written; October nearly done.

Weekly Weather Report, 1890.—All numbers issued to date.

Monthly Summaries.—Same as at time of last report.

Appendices I. to IV.—Well in hand, and proceeding satisfactorily.

Means of Pressure, Temperature, and Rainfall for long series of years well in hand.

Daily Weather Report, 1890.—All issued to date, with monthly correction and addition sheet for May.

Checking Daily Forecasts, 1890.—Slightly in arrears; delayed by work mentioned in next item.

Checking (final) of Storm Warnings, 1889.—Nearly completed.

The summer vacation has now commenced for part of the staff in this branch; hardly any progress is therefore being made with anything but routine work, nor is there likely to be much until the middle of October next.

(Signed) FREDEC. GASTER.

PANTAGRAPH ROOM.

July 12th, 1890.

Hourly Readings.—The calculation of the mean values for 1887 is still in hand. During the progress of this work some modifications of the practice first adopted, in certain cases, has been found desirable, and has caused an additional amount of work which will not arise with subsequent years.

Miscellaneous.—The tabulation of the curves of the electrical anemometer has been kept up to date for comparison with the results yielded by the ordinary anemometer at Kew. The usual routine work of the room has been kept up to date.

(Signed) R. H. CURTIS.

R. H. Scott, Esq., F.R.S.

EXAMINATION BRANCH.

July 1st, 1890.

Examinations.

May 1890.—Completed.

June 1890.—Partial.

Weekly examination (on receipt) of curves and documents from all observatories.

Reports, &c.

May 1890.—Copies of the "Notes of Errors" to all observatories, and monthly report thereon.

Miscellaneous.

Computations *re* the hourly fall of rain at the seven observatories, 1883 and 1884.

Various items, such as putting covers to the tabulations, &c., the changing of notice boards in balcony, have occupied much of Messrs. Parsons and Hewitt's time during the month.

(Signed) T. E. ALLEN.

Reported—That the cash accounts for the six months ended the 31st March 1890 had been audited on the 9th instant by the Chairman and Mr. Galton, and would be forthwith sent to the Treasury for the Audit Office. The receipts for the six months amounted to 8,994*l.* 5*s.* 6*d.* The payments amounted to 9,163*l.* 6*s.* 2*d.*, leaving a balance of 3,416*l.* 6*s.* 8*d.* in hand and at the bank on the 1st April 1890, as against 3,468*l.* 12*s.* 9*d.* on the 1st April 1889.

LIABILITIES.					ASSETS.									
To Council	-	-	-	-	£	s.	d.	By cash at Bank	-	-	-	£	s.	d.
					250	0	0					3,441	1	5
„ outstanding accounts or work uncompleted	-	-	-	-	325	14	9	„ „ at Office	-	-	-	82	6	4
„ Post Office (partly estimated)	-				217	15	4	„ H.M. Exchequer	-	-	-	325	0	0
„ sundry creditors	-	-	-		446	13	11	„ sundry debtors	-	-	-	309	11	4
„ balance	-	-	-	-	2,917	15	1							
					£4,157	19	1					£4,157	19	1

* Some expenses under this head not yet brought to account.

Submitted—The following statement respecting the Records for January to June, 1890, received from the Self-recording Observatories (see Minutes, 21st December, 1868; 20th November, 1876; 3rd January, 1883; and 6th March, 1889):—

JANUARY-JUNE, 1890.	ABERDEEN.		ARMAGH.		FALMOUTH.		KEW.		VALENCIA.	
ANEMOGRAPH :—	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.
<i>Action of Instrument</i> - - -	Good.	Good.	Good.	Fair.	Good.	Good.	Good.	Good.	Good.	Good.
<i>Records deficient :—</i>										
Due to stoppage of clock - - -	0	0	12 hrs.	13 hrs.	0	1 hr.	0	0	0	0
„ other causes - - -	0	0	0	0	0	0	14 hrs.	14 hrs.	0	0
<i>Number of errors discovered :—</i>										
By general examination - - -	0	0	13	8	13	27	3	3	19	0
<i>Results of 40 Remeasurements :—</i>										
Greatest difference - - -	1·0	2·0	1·0	2·0	1·0	2·0	1·0	2·0	1·0	2·0
Mean difference irrespective of sign - - -	0·2	0·6	0·1	0·5	0·1	0·4	0·2	0·4	0·1	0·5
Residual difference (— Meteorological Office)	+0·1	0·0	0·0	−0·1	0·0	0·0	0·0	+0·1	0·0	+0·1
<i>Orientation verified</i> - - -	Monthly	—	Monthly	—	Monthly	—	Monthly	—	Monthly	—
RAIN GAUGE :—										
<i>Action of Instrument</i> - - -	Good.		Good.		Indifferent.		Good.		Good to Indifferent.	
<i>Records deficient :—</i>										
Due to stoppage of clock - - -	0		0		8 hrs.		0		0	
„ other causes - - -	0		0		0		0		0	
<i>Number of errors discovered :—</i>										
By general examination - - -	3		14		23		8		3	
	ABERDEEN.		FALMOUTH.		KEW.		VALENCIA.			
BAROGRAPH :—										
<i>Action of Instrument</i> - - -	Good.		Good.		Good.		Good.		Good.	
<i>Character of Photography</i> - - -	Good to Excellent.		Do.		Do.		Do.		Fair.	
<i>Records deficient :—</i>										
Due to stoppage of clock - - -	0		3 hrs.		0		0		0	
„ failure of light - - -	0		0		2 hrs.		0		0	
„ other causes - - -	0		3 hrs.		0		8 hrs.		8 hrs.	
<i>Number of errors discovered :—</i>										
In entry of standards - - -	0		6		1		2		2	
„ calculating residuals - - -	0		5		1		0		0	
„ applying „ - - -	0		6		0		12		12	
By general examination - - -	1		107		12		81		81	
<i>Results of 40 Remeasurements :—</i>										
Greatest difference - - -	·007		·007		·008		·007		·007	
Mean difference irrespective of sign - - -	·002		·002		·003		·002		·002	
Residual difference (— Meteorological Office)	·000		·000		+·001		·000		·000	
<i>Mean monthly difference between simultaneous Barograph and Standard Barometer readings</i> - - -	·001		·002		·002		·002		·002	
THERMOGRAPH :—										
<i>Action of Instrument</i> - - -	Good.		Good.		Good.		Good.		Good.	
<i>Character of Photography</i> - - -	Do.		Do.		Do.		Do.		Do.	
<i>Records deficient :—</i>										
Due to stoppage of clock - - -	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.
„ failure of light - - -	0	0	0	0	0	0	8 hrs.	8 hrs.	0	0
„ imperfectly moistened bulbs - - -	10 hrs.	10 hrs.	0	0	0	0	1 hr.	0	0	0
„ partially frozen bulbs - - -	—	0	—	7 hrs.	—	38 hrs.	—	0	—	0
„ other causes - - -	—	78 hrs.	—	22 hrs.	—	51 hrs.	—	0	—	0
By general examination - - -	1 hr.	1 hr.	12 hrs.	12 hrs.	0	5 hrs.	3 hrs.	0	0	0
<i>Number of errors discovered :—</i>										
In entry of standards - - -	1	0	10	9	0	1	1	1	1	1
„ maxima and minima - - -	1	—	7	—	5	—	10	—	10	—
By general examination - - -	4	2	19	37	6	13	24	19	24	19
<i>Results of 40 Remeasurements :—</i>										
Greatest difference - - -	0·2	0·2	0·2	0·2	0·2	0·2	0·2	0·2	0·2	0·2
Mean difference irrespective of sign - - -	0·1	0·1	0·1	0·1	0·1	0·1	0·1	0·1	0·1	0·1
Residual difference (— Meteorological Office)	−0·1	0·0	0·0	0·0	−0·1	0·0	+0·1	0·0	+0·1	+0·1
<i>Mean monthly difference between simultaneous Thermograph and Standard Thermometer readings</i> - - -	0·2	0·2	0·1	0·1	0·1	0·2	0·2	0·2	0·2	0·2

Aberdeen.

Rain-gauge.—The Stonyhurst "lifter" was acting imperfectly at the beginning of the period under notice, and the attachment of the papers to the cylinder was not always satisfactory.

Anemograph.—The traces being very faint during damp weather, attributed by Mr. Boswell to the moist state of the papers in February, he "placed some chloride of calcium beside cylinder, to counteract the action of damp on the sheets," with satisfactory results. The bearings were oiled on March 31st, and again on April 17th.

Barograph.—*Thermograph.*—The photography is excellent and the action of the instruments apparently perfect. The thermograph zero lines were changed from winter to summer positions on May 23rd.

Armagh.

Rain-gauge.—The discharger was working imperfectly in January. The stated times of beginning and ending are not in accord with the terminations of the traces, and the attachment of the papers is not always good, particularly during Dr. Dreyer's absence from the observatory.

Anemograph.—The velocity traces are intermittent at low rates, owing to a mechanical defect.

Falmouth.

Rain-gauge.—Owing to some imperfection the traces are very unsteady at times; attention has been called to the matter, but neither the observer nor the inspector have been able to discover the cause. The appearance of the traces also gives reason to suppose that the attachment of the papers is not carefully made; this, however, is denied by Mr. Kitto, who is unable to account for the bagging, &c, apparent. From the fact that it is not always prevalent, there can be little doubt that it arises from a preventable cause.

Anemograph.—Satisfactory in its working.

Barograph.—The condensing lens was "unaccountably" shifted out of position on January 11th, causing indifferent results. In February the definition of the lower edge of traces was somewhat unsatisfactory, the air-hole and temperature bar was examined and barograph tube firmly fixed on the 6th. Again in March the instrument was examined and its setting improved.

Thermograph.—Curves disfigured by secondary images. The zero lines were changed from winter to summer positions on May 3rd.

General.—There is evidence in the work from this station that the rule as to the forwarding of the original tabulations is not complied with.

Kew.

Rain-gauge.—Attachment sometimes unsatisfactory.

Anemograph.—During January the pricker was apparently very defective, and great disagreement existed between the stated times of beginning and ending and the markings of the pricker. A new pricker was fitted on March 31st. In April it was noticed that the two north ends of the direction pencil did not work together, and that the pencil was slightly bent at the lower end; the action was improved (see curve 104). The bearings were oiled on May 2nd, and on the 13th the instrument was dismantled and cleaned, "Bell's Asbestos Lubricant Oil" being "used for the outside bearings."

Barograph.—A penumbra or second edge to lower part of trace during first half of January. Experiments were made to secure better definition by placing blue glass in front of the light, but with unsatisfactory results; subsequently the light was reduced, and this had the desired effect (see curve 20-21). The blue glass was removed on February 3rd without interfering with the definition.

Thermograph.—The definition of the wet trace was not so good at the end of the period. The zero lines were changed from winter to summer positions on May 3rd.

Valencia.

Rain-gauge.—The attachment of the papers to the cylinder was not good. There was occasional imperfect action of the float during March, and on the 22nd the mercury and plunger were cleaned. The result, however, was not altogether unsatisfactory, and in April the "Stonyhurst lifter" was detached, and a decided improvement was noticeable in the action of the instrument, although it was not quite perfect during the following month.

Anemograph.—In satisfactory working order.

Barograph.—Definition of lower edge of trace somewhat indifferent, attributed to the light (lamp). For an illustration of the effect of the sun shining on the instrument, see temperature trace on curve 38-39. Some little trouble was caused by the imperfect action of the light shutter during April.

Thermograph.—On May 24th Mr. Cullum wrote: "Dry-bulb speck out of range of light, trace too faint to tabulate. Lowered thermometers to save winter zero lines, the values being so much more satisfactory than the summer."

Secondary images, interfering with the traces, appeared toward the end of the period.

(Signed) THOMAS E. ALLEN.

The subject of the engagement of boys in the Office was discussed, and the following regulations were adopted, being mainly in accordance with those recently adopted by the Kew Committee:—

REGULATIONS for the ENGAGEMENT and EXAMINATION of BOY CLERKS at the METEOROLOGICAL OFFICE.

1. The salaries of boy clerks will begin at from 12s. 6d. to 15s. 6d. per week, according to the age of the lads, and will rise annually by 1s. 6d. per week up to a maximum of 20s. per week.

2. Candidates must be not less than 15 and not more than 17 years of age on the first day of the examination referred to in the next paragraph.

3. No boy shall be eligible to serve as a boy clerk in the Meteorological Office who has not passed an examination recognized by the Council as equivalent to that of the Civil Service Commission in the following subjects, viz.:—

Handwriting,
Orthography, and
Arithmetic, including Vulgar and Decimal Fractions.

4. Boy clerks will not be retained as such after completing their 20th year, but will be eligible, subject to Rule 5, for appointment to the regular staff, when suitable vacancies occur, after two years (or if admitted after 17 years of age, one year) of good service to the satisfaction of the Secretary.

They will also be considered eligible, subject to Rule 5, to fill suitable vacancies occurring within two years of their leaving the Office, provided they have served in it not less than two years.

5. No boy shall be eligible for appointment to the regular staff unless he has passed two of the examinations in the advanced stage of the Science and Art Department in the following subjects:—

- a. Subject 5. Mathematics (II. Stage),
- b. " 6. Theoretical Mechanics,
- c. " 8. Sound, Light, and Heat,
- d. " 9. Magnetism and Electricity,
- e. " 10. Inorganic Chemistry,
- f. " 23. Physiography,

or the same subjects at any other examination recognized by the Council as equivalent.

6. It is to be clearly understood that boy clerks are liable to be discharged at the discretion of the Council on receiving one week's notice.

Submitted—The following list of publications which had been received since the last meeting:—

Monaco, Prince A. de.—Expériences de flottage sur les courants superficiels de l'atlantique nord.

Latham, B.—Report on the sanitation of Bombay.

Singer, K.—Die Schneedecke in Bayern im Winter 1888–89.

Coimbra, Observatorio Meteorologico e Magnetico.—Observações meteorologicas. 1889.

Lang, C.—Bericht über die Thätigkeit der kgl. bayerischen meteorologischen Centralstation und der ihr angeschlossenen Stationen im Jahre 1889.

— Beobachtungen der meteorologischen Stationen Bayern's und der Nachbargebiete am 19 Juni 1889, gelegentlich einer Ballonfahrt.

— Die Fortpflanzungsgeschwindigkeit der Gewitter in Süddeutschland während des Jahres 1889.

Horn, F., und Tillman, C.—Beobachtungen über Gewitter in Bayern, Württemberg und Baden während des Jahres 1889.

— — Die Gewitter und Hagelschläge vom 21 September 1889.

London, Army Medical Department.—Report. 1888.

Riggenbach, A.—Witterungs-Übersicht der Jahre 1888 und 1889 sowie neue Normal-Mittel für Niederschlag und Temperatur.

London, R. Astronomical Society.—Memoirs. Vol. xlix., Part ii.

Prague, K. Böhm. Gesellschaft der Wissenschaften.—Abhandlungen der mathematisch-naturwissenschaftlichen Classe vom Jahre 1889–90. vii. Folge, 3 Bd.

Carlsruhe, Centralbureau für Meteorologie und Hydrographie.—Die Ergebnisse der meteorologischen Beobachtungen im Jahre 1889.

63, *Victoria Street*, October 29, 1890.

PRESENT :

LIEUT.-GENERAL STRACHEY IN THE CHAIR.

MR. BUCHAN.
PROFESSOR DARWIN.

MR. GALTON.
MR. STONE.

THE HYDROGRAPHER.

The Secretary was in attendance.

The Minutes of the last meeting (July 16) were read and confirmed.

Read—A letter from the Treasury (No. 1878) asking that the estimates be furnished by November 28th.

Read—Letter 1813 from Lloyd's, stating that they were preparing "Lloyd's Seamen's Almanac," and asking if the Council had any suggestions to offer.

Mr. Scott was instructed to make further inquiry as to the character of the proposed publication. (P.C. 1891.)

Reported—That a reprint of the "Barometer Manual for Seamen" was called for.

Captain Wharton and Mr. Buchan agreed to look over the work to see if any alteration was desirable.

Submitted—A report by Mr. R. Curtis on the working of the electrical anemometer at Kew (Minutes, p. 28).—Referred to the Chairman.

Read—The following letter :—

(M.O. 1779.)

Engineer-in-Chief's Office, General Post Office,
October 10, 1890.

ELECTRICAL ANEMOMETER.

DEAR SIR,

MR. PREECE informs me that arrangements have been made to give the electrical anemometer, made by the Department, a six or eight months' trial on the roof of the General Post Office building, under our own supervision.

I should be glad, therefore, if you could arrange for the apparatus to be sent here at your convenience, so that the trial could commence as early as possible.

Yours, &c.
(Signed) H. R. KEMPE.

R. H. Scott, Esq.

Mr. Scott was instructed to inform the Post Office that the electrical anemograph could be lent to them, but that for any satisfactory test it ought to be compared with an ordinary anemograph close by. Inquiry to be further made if the Post Office would be disposed to erect such an instrument if supplied by the Office. The records to be kept properly, and the original curves forwarded to the Office regularly at weekly intervals. (P.C. 1914.)

Read—The following letter (Minutes, 1884, p. 109) :—

(M.O. 1815.)

Chemical Laboratory,
St. Bartholomew's Hospital, E.C.,
October 16, 1890.

DEAR MR. SCOTT,

AS you are I doubt not aware, a Committee of the Horticultural Society, with a grant from the Royal Society, are going to attack the subject of "fogs." Will the Meteorological Council allow them the use of the large pump which I had made for a similar purpose, and which is still in the cellar here?

I am, &c.
(Signed) W. J. RUSSELL.

Mr. Scott was instructed to grant permission (P.C. 1892), and ask for a copy of the report when completed.

Submitted—The following :—

REPORT on the INSPECTION of the IRISH and WELSH STATIONS.

GENTLEMEN,

I HAVE to report that I have completed my usual inspections. The only stations unvisited on this occasion have been Malin Head (telegraphic), Londonderry (Second Order), and two Weekly Weather Report stations, Llandoverly and Kilkenny.

TELEGRAPHIC STATIONS.

St. Ann's Head, visited September 25.—This station calls for no remark.

Roche's Point, visited September 27.—I found that a new rain-gauge was required, and it has been supplied. The situation of the barometer is, and has always been, most inconvenient.

Valencia, visited October 1.—The only matter calling for notice is that there are frequent complaints of delay in the telegrams, owing to lateness of attendance at the local post office. I have further remarks on this station, which will be found in the next section of the Report.

Donaghadee, visited October 6.—This station is good, but the observer's health is not satisfactory, and in damp weather the observations are taken by substitutes, who are all fairly competent.

Mullaghmore, visited October 9.—The station is in good order. An endeavour is being made to have the wire carried to the post office here. If this is done it would release the Office from its engagements as to the private wire.

Belmullet, visited October 11.—The station is in good order, but, as is usual at other stations, the space available for rain-gauge and thermometer screen is not adequate. At this place Mr. Davies, the new Coastguard officer, suggests that the sea temperature observations now taken at Claggan in Blacksod Bay, be taken instead at Blacksod Point, where there is greater depth of water, and freer sea circulation. I recommend that the Admiral Superintendent of Naval Reserves be requested to make this change.

Parsonstown, visited October 16.—The station is in good order. The wind observations are not satisfactory, as the demesne is thickly wooded. The Council can gather the effect of this from a remark of Dr. Boëddicker's to me, to the effect that, he was often able to photograph with the 3-foot reflector when there was a breeze outside in the open country.

Holyhead, visited October 21.—This station is also in good order. I saw the bridled anemometer. The new arrangement of cups, as ordered by Sir G. Stokes, has been carried out. The instrument has occasionally been worked with quick motion, so as to expand the time scale. I would suggest that Mr. Dines be requested to examine into the possibility of devising a scale for measuring the indications of this instrument.

On the whole, I can say that I found all the telegraphic reporters attentive and efficient, and the instruments clean and in reasonably good order.

Tory Island.—As regards the proposed change of the Lloyd's signal station from Malin Head to Tory Island, I learnt, when I was on the coast, on the authority of a lightkeeper now stationed at Tory, that Lloyd's have been unable to get the materials for the proposed signalman's residence landed before the winter, so that this station cannot be ready before Easter.

The regular communication with the island is by post boat (sailing), from Gort-a-hurk coast-guard station, near the Bloody Foreland, distant about 10 miles from the island. There is no sleeping accommodation near Gort-a-hurk, and the post boat only sails once a week. I hear the hire of a special boat is 35s. at least. Passengers can reach Tory by the steamer from Sligo to Glasgow, landing in a boat. This route probably involves a stay of about four days on the island.

SECOND ORDER STATIONS AND OBSERVATORIES.

St. David's, visited September 24.—This station was, as usual, in excellent order.

Valencia Observatory, visited October 1.—I did not examine the S.R. apparatus as Mr. Baker was expected in a week from my visit.

I found that the Post Office authorities had not yet removed the posts and wire from Kilbeg Hill. There is a certain quantity of apparatus, cells, &c. at the observatory, the property of the Council. I have instructed Mr. Cullum to prepare a list of this, and send it up for your instructions as to its disposal.

I visited Westwood House, 1 mile from Cahirciveen. This is now vacant. It is an ordinary dwelling-house standing in 20 acres of land, with frontage to road and sea, held under a direct lease from Trinity College, with 80 years to run.

Its situation is much more open than the present locality of the observatory, and the fact of its being within a mile of a town, without the intervention of a ferry, would render communication much easier and cheaper.

Dublin, Mountjoy Observatory, visited October 4.—The observer at this station has been changed, Sergeant Lipscombe having retired; Corporal Stone now takes the observations. He is careful and efficient.

Dublin, Glasnevin Gardens, visited October 4.—This station goes on very satisfactorily. We have not had of late as much interference with the instruments by children visiting the gardens as in former years.

Dublin, Fitzwilliam Square, visited October 4.—This station calls for no remark ; it is always in excellent order.

Lissan, visited October 7.—This is a new station, the records from which are supplied by the Scotch Meteorological Society. It is the property of Sir N. Staples, Bart., who, when at home, is the observer. His substitute, J. Donaldson, the gardener, is very efficient.

The instruments are not of the quality usual at Second Order Stations, as only one of the thermometers is graduated on the stem. The barometer is of the Kew pattern, by Adie of Edinburgh, but bears no distinguishing number that I could discover. The rain-gauge is worn out.

The observer, Donaldson, had received no printed instructions at any time.

The situation of the station is good ; the country about is undulating, but less so than at Armagh.

Slieve Gallion, height 1,500 feet, is distant about 4 miles on the North and N.N.W.

Armagh, visited October 8.—The instruments are all in good order. At this station there is an old standard barometer by Newman, which seems to be a very good instrument. I propose that the Council should have this cleaned ; and then their own standard, supplied in 1868, might be recalled, and be available for use elsewhere.

Colebrooke, Brookborough, visited October 8.—This station calls for no special remark.

Markree, visited October 10.—This station is in very good order, Mr. Marth having trained his servant to take the readings accurately.

Curreygrane, visited October 15.—This station is satisfactory, the new observer being now quite efficient.

Parsonstown, visited October 16.—At this station a new observer takes the 9 p.m. readings. His name is White, and he has had previous training, so that the work is well done.

I also visited a few fishery barometers and a sunshine record station.

Ballycastle, co. Antrim, visited October 18.—A barometer supplied to this station last summer was reported to be useless. I went down especially and found air in the tube, which I removed, and left the instrument in apparently perfect order.

Carnarvon, visited October 22.—The barometer is suspended just inside the entrance door of the Custom House, and is properly attended to, the diagram being kept correctly. Mr. Holmes, the collector, is a very old correspondent of the Office.

Nevin or Morfa Nevin.—A barometer was supplied at Mr. Holmes's suggestion last spring. On inquiry, I found that it had been erected in a private house. I wrote (P.C. 1782) to the effect that it must be erected in some situation accessible to the public, and Mr. Holmes has promised to see that this is done, as the place is within his district. He had never been informed that the barometer had been received. He told me that the same thing had occurred at Carnarvon before his arrival, a barometer supplied for Abersoch, had been intercepted in transit at Carnarvon and suspended in a private house. This is the barometer above referred to as at the Custom House. The demand for Abersoch was apparently only a blind.

Llandudno, visited October 22.—I went to this station to see the sunshine recorder which had been transferred from the Great Orme's Head to the end of the pier by Mr. Whipple in the summer. I found it still somewhat out in level and in azimuth, but set it right. The man in charge of it, John Roberts, the piermaster, seems very intelligent and careful.

(Signed) ROBERT H. SCOTT.

WEEKLY WEATHER REPORT STATIONS.

Waterford, visited September 26.—The observations are carefully taken.

Foynes, visited October 2.—This station is in good order, but the observations are only kept up when Lord Monteagle is at home.

Corrections to be applied to readings of—

STATIONS.	Dry Bulb.	Wet Bulb.	Max.	Min.	Spare Ther.	REMARKS.
STATIONS OF THE SECOND ORDER.						
Armagh - -	-0.2	-0.3	-1.0	0	0	Grass min. + 0.7, Kew standard -1.2. Observer reads high.
Brookeborough - -	-0.5	-1.0	-0.1	+1.0	—	
Dublin (City) - -	-0.3	-0.3	-0.8	0.0	—	Grass min. -0.5. Do. +0.4. Do. -0.2.
Dublin (Phoenix Park)	-0.4	-0.5	-0.2	0.0	-1.0	
Edgeworthstown - -	-0.6	-0.6	-0.6	+0.2	—	
Glasnevin - -	-0.2	-0.4	-1.0	+0.4	—	Kew standard -0.1.
Lissan - -	-0.8	-0.9	0.0	+0.5	—	
Markree Castle - -	-0.1	-0.2	0.0	+0.1	-0.2	Grass min. -0.2.
Parsonstown - -	-0.5	-0.0	-0.4	0.0	—	
St. David's - -	-0.2	-0.3	0.0	-0.1	—	

STATIONS.	Dry Bulb.	Wet Bulb.	Max.	Min.	Spare Ther.	REMARKS.
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TELEGRAPHIC REPORTING STATIONS.

Holyhead	-	-	-0.1	-0.2	-0.2	+0.4	-0.2	
Mullaghmore	-	-	-0.1	-0.1	+0.1	+0.5	-0.2	
Belmullet	-	-	-0.2	-0.1	-0.1	-0.2	—	No spare ther.
Donaghadee	-	-	-0.5	-0.6	-0.1	-0.2	-0.5	
Parsonstown	-	-	-0.8	-0.1	-0.8	-0.3	—	No spare ther.
Valencia	-	-	-1.1	-0.7	-0.3	+0.2	-0.2	
Roche's Point	-	-	-0.7	-0.7	-0.4	+0.2	—	No spare ther.
St. Ann's Head	-	-	-0.2	-0.5	+0.2	-0.5	-0.3	

Malin Head not inspected this year.

WEEKLY WEATHER REPORT STATIONS.

Killarney	-	-	-0.2	-0.2	0.0	0.0	—
Waterford	-	-	-0.7	-0.8	-0.2	0.0	—
Foynes	-	-	—	—	-0.2	+0.2	—

Londonderry, Kilkenny, and Llandoverry not inspected this year.

REPORT of INSPECTION of the SCOTTISH STATIONS for 1890.

Barometers.—During August the inspection of the barometers did not include a comparison with the standard mercurial barometer. This comparison was made as regards the last 12 stations inspected, which is inclusive of six barometers not previously reported on to the Council. From the direct and indirect comparisons made, I am able to report that the whole of the barometers specified in the annexed Table are correct, allowance for instrumental errors being made, are in good order, and the observations accurately made.

TABLE I.

STATIONS.	Inspector's Standard No. corrected.	Reporting Barometer uncorrected.	Check Barometer uncorrected.	REMARKS.
	Inches.	Inches.	Inches.	
Laudale	—	30.248	30.242	Check barometer is 8 feet higher.
Fort William	—	30.208	—	
The Observatory F.W.	—	—	—	
Fort Augustus	—	29.774	—	Standard mercurial barometer not taken this year to these stations.
Glencarron	—	29.130	—	
Lairg	—	28.835	—	
Dunrobin	—	29.120	—	
Wick	—	29.114	—	
Swanbister	—	29.776	—	
Stornoway	—	29.800	29.800	
Nairn	—	29.648	29.648	
Gordon Cas	—	29.486	—	
Aberdeen	—	29.173	29.170	
Braemar	—	28.200	28.180	Check is standard of observatory. Do. old baro. now out of order.
Lednathie	—	29.189	—	
Dundee	—	29.985	—	Check barometer in Mr. M.'s house.
Callton Mor	29.935	29.900	—	
Rothsay	29.954	29.958	—	
Ardrossan	29.893	29.888	29.854	
Glasgow	30.028	30.030	—	
Clober (Milngavie)	29.718	29.694	—	
Ochertyre	29.680	29.670	—	
Hawick	29.462	29.462	—	
Wolfelee	28.800	28.800	—	
Marchmont	29.676	29.676	—	
Edinburgh	30.039	30.082	—	Check, a Redier's barograph.
Leith	30.480	30.486	—	
Rosewell	29.643	29.632	—	

Thermometers.—The minimum thermometers were this year again very specially examined, but with a result scarcely so satisfactory as last year. The following were out of order: At Wick about 4°0 were lodged near the top of the tube. A comparison of the past readings will show how long this thermometer had been out of order. At Rothsay a minute portion of spirit, about 0°3, was lodged at the very top of the top. At Leith 1°8 of the spirit was lodged near the top of the tube

This was discovered by the observer about five months ago, who since then has regularly added fully a degree and a half to each reading. All these thermometers were rectified.

New minimum thermometers have been supplied to Dunrossness and Nairn.

TABLE II.

STATIONS.	Standard No. 4433, cor- rected.	Dry Bulb.	Wet Bulb.	Spare Thermo- meter.	Max. Thermo- meter.	Min. Thermo- meter.	Time in Water in Minutes	Change of Tempera- ture.	REMARKS.
Laudale -	60.4	+0.2	+0.2	—	+0.2	+0.3	150	+0.4	C. Livingston ob- server.
Fort William -	63.1	—0.1	+0.1	—	+0.1	—0.3	60	+0.4	
The Observatory F.W.	63.9	+0.1	+0.1	—	0.0	—0.1	90	+0.5	
Fort Augustus -	58.8	+0.1	+0.1	—	+0.1	—0.4	80	Uniform.	
Glencarron -	55.7	0.0	—0.2	—	0.0	—0.2	100	+0.3	Index of Max.T. lost. Min. T. was 4° out of order.
Lairg -	57.8	+0.2	+0.1	—	—0.3	0.0	70	+0.2	
Dunrobin -	60.0	—0.5	—0.4	—	—	—0.6	75	Uniform.	
Wick -	58.7	+0.5	+0.4	—	—0.3	—	60	Do.	
Stornoway -	55.9	+0.5	+0.5	—	+0.7	—0.4	90	Do.	Old Min. not now used +1°0.
Nairn -	54.5	+0.7	+0.6	+0.1	0.0	—0.1	90	Do.	
Gordon Cas -	57.0	+0.1	+0.2	—	+0.5	+0.1	120	+0.7	
Aberdeen -	57.2	+0.2	+0.2	—	+0.1	+0.1	75	—0.2	
Braemar -	54.7	+0.4	+0.5	—	+0.2	0.0	90	+0.3	Temp. practically uniform.
Lednathie -	51.9	+0.2	0.0	—	+0.2	—0.1	100	Uniform.	
Dundee -	52.6	+0.5	+0.4	—	+1.4	—0.3	60	Do.	
Callton Mor. -	59.6	+0.1	0.0	—	+0.8	—0.5	60	—0.3	
Rothsay -	56.0	0.0	0.0	—	+0.2	—0.4	65	Uniform.	
Ardrossan -	54.7	+0.2	+0.3	—	—0.2	—0.2	80	—0.2	
Glasgow -	55.8	—	—	—	—0.2	—0.1	50	+0.2	
Clober -	55.7	—0.1	+0.1	—	+0.5	+0.1	75	Uniform.	
Ochertyre -	53.8	0.0	0.0	—	+0.1	0.0	70	Do.	
Hawick -	59.2	0.0	—0.1	—	—0.1	+1.0	80	+0.3	
Wolfelee -	53.0	—0.2	—0.2	—	+0.2	—0.5	120	—0.3	
Marchmont -	53.4	—0.1	—0.1	—	0.0	—0.1	300	Uniform.	
Edinburgh -	52.7	—0.1	0.0	—	0.0	0.0	85	Do.	
Leith -	52.5	+0.2	+0.4	—	+0.2	—0.4	50	Do.	

Hygrometers.—I have to report very favourably regarding the care with which the wet-bulb thermometer is attended to at all the stations without exception. While inspecting the station at Rothsay the weather was dull and drizzling, the air being apparently filled with the fine drizzle, the dry and wet bulbs in the screen read exactly the same. This is the first occasion I have seen this correspondence to occur since it was begun, some years ago, to give special attention to the working of the hygrometer in the thermometer screen.

Laudale, August 7th, 1890.—There has been some trouble at this station from the index portion of the column of the maximum thermometer being shaken from its position during high winds. Accordingly, since last inspection, four new wooden supports and four new wire stays have been added to the Stevenson screen, which is now very firmly fixed, and it is believed the index now retains its place in high winds. The instruments were all in very good order, and the observations are carefully made.

Fort William, August 9th.—The instruments were in good order, and the observations are correctly made. It has been resolved that the observations at this station, inclusive of those recorded by barograph and thermograph, be continued for some time till a satisfactory comparison be made between them and the observations made at the new observatory.

The Observatory, Fort William, August 8th–9th.—This observatory has been equipped as a station of the First Order by the Meteorological Council, and as a station of the Second Order by the Scottish Meteorological Society. Both sets of observations are forwarded to the Meteorological Office.

The Stevenson screen, rain-gauge, and sunshine recorder are placed in an open situation over grass, on which the sun shines all day from one hour after sunrise to sunset in summer, and the whole day in winter. There are three rain-gauges, Beckley's, and accompanying check gauge, and one of the type in use at the Ben Nevis Observatory.

The self-recording instruments furnished by the Council have been recently fitted up by Mr. Baker, of the Kew Observatory, and the regular observations commenced on July 14th.

Everything at the observatory was in excellent order, and the observations were made with the greatest care and punctuality.

The Abbey, Fort Augustus, August 11th.—The instruments were all in excellent order and are particularly well attended to and observed by Father Cody, the new observer. The sun reaches the sunshine recorder all day, except when not behind the mountains, which here form a very irregularly outlined horizon.

Glencarron, August 14th.—All the instruments were in very good order, and are observed with scrupulous accuracy. A Richard's hygrograph has just been added to this station and is placed in the same Stevenson screen with the thermograph. The observations with the sunshine recorder have ceased.

Lairg, August 14th–15th.—The thermometer screen has been furnished with a new stand, been repainted, and thoroughly repaired. A new rain-gauge has been sent since the date of inspection, viz., on October 8th. The instruments were otherwise in good order and are well observed.

Dunrobin, August 15th.—The index of the maximum thermometer (Phillips') was inadvertently lost at the time of the inspection. A new one was sometime after sent from Edinburgh. All the other instruments were in good order, and are carefully observed.

Wick, August 15th.—The minimum thermometer was seriously out of order, a part of the spirit, about $4^{\circ} \cdot 0$, being lodged near the top of the tube. This was shaken down. On comparison with the standard, as it still read $0^{\circ} \cdot 7$ too low, it was ordered to be placed in a highly inclined position for some hours before being replaced in the screen, to allow time for the whole of the spirit to drain down. Subsequent readings show that it is now correct. The other instruments were in good order, and are very well observed.

I drew the observer's attention to the lateness of his telegrams recently, and spoke seriously to him about the matter, and that it was absolutely necessary that this state of things be rectified. He promised that due attention would be given to this matter in future.

Swanbister and Stennis, August 18th.—At the time of Mr. Fortescue's removal from Swanbister, the instruments were handed over to Mr. W. Halcro, joiner, who had been one of the assistant observers. He made the observations regularly and forwarded them to Mr. Fortescue for entry on the monthly schedules. Here the temporary positions of the instruments were good, but the maximum thermometer had been accidentally broken in the end of last year, of which no intimation was given. (A new one was forwarded on my return to Edinburgh in October.) Thereafter I drove to the station at Stennis, taking the barometer with me, and placing it in its new position, and arranged with Mr. Fortescue, who kindly accompanied me, and with Mr. Spence, the new observer, for the immediate removal of the rest of the instruments to Stennis, and the positions in which they were to be placed. The situation of Stennis is a very open one, and Mr. Spence is likely to prove a good intelligent observer.

Stornoway, August 20th.—Particular attention was given to the omission from the daily telegram of July 25th of any notice of the rapid fall of the barometer and storm during the previous night, for which Mr. Forbes expressed great regret. He made no attempt to account for the neglect, but he is unable to understand how it did occur. I believe the effect will be to make him thoroughly alert in future against the recurrence of so serious an omission. The rain-gauge was slightly deformed, but it was made right. The glass measure was broken accidentally on the Saturday. What remains still measures $0 \cdot 3$ inch, and will be used till a new measure arrives. All the other instruments were in excellent order and are well observed.

Nairn, August 22nd.—The instruments were all in good order and intelligently observed, and the telegrams made up with care and expertness. The new minimum thermometer was hung up and the old one packed in the box and ordered to be despatched to the Office.

Gordon Castle, August 23rd.—Mr. John Webster, who had observed nearly 40 years, died last Christmas, and has been succeeded by his son Charles as head gardener and observer. The instruments are well exposed and placed in the kitchen garden, and were all in excellent order, and observed with great care and accuracy.

Aberdeen, August 26th.—Everything at this station is well attended to, and the observations are made with remarkable care and intelligence.

The same remark applies to the self-recording instruments of the observatory. At the time of the inspection the "drop" from the wet-bulb fell at the rate of one in a minute and a half. As at the Fort William observatory, the rain-gauge, after being emptied, does not begin to register till $0 \cdot 005$ inch of rain has fallen. It was satisfactory to observe from an examination of the curves, as showing the state of efficiency of the anemometer, that changes of wind were quickly shown with such small velocities as a rate of from 2 to 3 miles an hour.

Braemar, August 27th.—As indicated in last Report, a new set of instruments has been supplied by Her Majesty to this station to replace those in use since 1855, and the screen in which they are kept has been thoroughly repaired and painted. They are superior instruments, kept in excellent order, and are well observed by Mr. Aitken and his niece.

Lednathie, August 29th.—Everything at this station was in very good order, and the observations are made with remarkable intelligence. The vane works well except during frost, but in all cases its indications are checked by observations of smoke, trees, &c. The station is well up the slope of the Lednathie Burn, a tributary of the Prosen. The situation in the valley gives necessarily an undue proportion of N.W. and S.E. winds.

Dundee, August 30th.—The instruments here continue to be thoroughly well kept and the observations accurately made.

Callton Mor, September 1st.—The instruments were in very good order, and are observed with much care and intelligence by Mr. Russell and assistant. As the index of the maximum thermometer (Phillips') was too long, it has since the time of inspection been sent to Edinburgh for rectification. This station was established in 1855, with the same observer, and substantially the same instruments throughout. The instruments are placed in a very open situation in the garden.

Rothsay, September 2nd.—A comparison of the minimum thermometer with the standard suggested an examination, when a minute portion of spirit (about 0°·3) was seen lodged at the top of the tube. This was rectified. With this exception, the instruments were all in thoroughly good order, and observed with great intelligence.

Ardrossan, October 1st.—The rain-gauge and thermometer screen are repaired and repainted, both jobs being well and strongly done. All the instruments now are in good order, and the observations are made with considerable intelligence.

Glasgow Observatory, October 2nd.—Except the 5 inches rain-gauge which has been raised to 16 inches above the ground, all the instruments remained as they were at the time of last inspection; they were all in very good order. Professor Grant was expected from Speyside on the following day. As the day of inspection was the annual holiday, the assistants had left before Professor Grant's letter intimating my visit reached them.

Milngavie, October 3rd.—The instruments at this station were in good order, and are intelligently observed and attended to. The anemometer is in a good position on a knoll in a field about a quarter mile from the other instruments.

For the sake of securing uniformity with the other stations of the Office, a Stevenson's thermometer screen was recommended, and it was also recommended that the barometer be removed from the large thermometer screen to the office adjoining. These suggestions have since been carried out. Mr. Bertram is very desirous in establishing this station that everything be in accordance with the requirements of the Office; and doubtless in his hands the station will become a valuable addition to the observing staff.

Ochertyre, October 4th.—Everything at this station was in excellent order, and the observations are made most intelligently.

Ladylaw, Hawick, October 14th.—The instruments are very good, and the observations, which began at the New Year, are intelligently and accurately made.

Wolfelee, October 15th.—Instructions were given to paint the Stevenson screen and the rain-gauge. As regards the other instruments, they are good, were in good order, and the observations made with great care. The observer showed a good deal of interest in the observations, and a strong desire to do all in his power to make them correctly.

Marchmont, October 18th.—The instruments are all in excellent order, and the observations made with marked intelligence. Mr. Loney has a good assortment of additional instruments at this station.

Edinburgh, October 21st.—In addition to the usual instruments, which are nearly all in duplicate, Mr. Mossman has a Redier's barograph, a Richard's thermograph, a Robinson's anemometer, and a sunshine recorder. The whole of the instruments are in remarkably good order, well placed, and are observed with much intelligence and enthusiasm.

Leith, October 22nd.—The minimum thermometer was found with 1°·8 of the spirit lodged near the top of the tube, which the observer, under my direction, set right. This was discovered by the observer five months ago, and since then the readings have been regularly increased by adding fully half a degree. Otherwise the instruments were in very good order, and the observations very intelligently made. Since last inspection the thermometer screen and enclosure has been repaired in a very satisfactory manner.

Rosewell, October 23rd.—The instruments are all good, and are well protected in a railed-off grass plot. They are in good order, and are attended to and observed with great care and intelligence.

(Signed) ALEXANDER BUCHAN.

Submitted the following :—

ABSTRACT of CAPT. TOYNBEE'S REPORT of INSPECTION of FISHERY BAROMETERS. (M.O. 1491.)

Station.	Situation.	Condition.	Remarks.
BOGNOR - -	Outside of the pier-house - -	Good - - -	Set, but not recorded.
RYDE - -	Inside a building on the pier-head	Do. - - -	Recorded.
EAST COWES -	Outside storeroom of coastguard -	Much damaged - -	Not recorded, and not accessible to fishermen or the public.
BEMBRIDGE -	In wall of Pilot-Boat Inn - -	Very good - - -	Recorded.
BRIXTON - -	In porch of watch-room - -	Excellent - - -	Not recorded.
ATHERFIELD -	Watch-room of coastguard - -	Very good - - -	Do.
VENTNOR - -	On the parade - - -	Good - - -	Recorded. Attached thermometer missing.
VENTNOR - -	Watch-room of coastguard - -	Very good - - -	Not recorded.
HASLAR HOSPITAL	Porch of main gate - -	Good - - -	Recorded.
POOLE - -	On quay outside Custom House -	Do. - - -	Set, but not recorded.

Station.	Situation,	Condition.	Remarks.
WYEMOUTH -	In boathouse on the quay -	Good -	Set twice daily.
PORTLAND -	In outer wall of seamen's reading room,	Do. -	Not recorded.
BUDLEIGH SALTER-TON.	In watch-house -	Very good -	Set, but not recorded. Badly placed.
EXMOUTH -	Outside Custom House door -	Do. -	—
CAWSAND -	Outside door of Temperance Institute.	Do. -	Not recorded.
MEVAGISSET -	Window of coastguard watch-house	Good -	Set.
GORRANHAVEN -	Window of boat-house -	Very good -	Do.
DEVORAN -	On stairs of public rooms -	Good -	Not recorded, but irregularly set by people passing.
PORTSCATHO -	In window of reading-room -	Fairly good -	Set, but not recorded.
PENRYN -	By Custom House door -	Very good -	Do.
DURGAN -	At the door of school-room -	Do. -	Do.
PORTHALLOW -	In the Cove, outside a manure store	Good -	Set.
FALMOUTH -	In long room of Custom House -	Do. -	Recorded.
COVERACK -	In the wall of a store belonging to Mr. Ellis.	Do. -	Set, but not recorded.
NEWLYN -	In a wall on Newlyn Cliff -	Do. -	Do.
MOUSEHOLE -	In the wall of schoolmaster's house	Do. -	Do.
ST. IVES -	Inside door of Pier Lighthouse -	Very good -	Set.
HAYLE -	In window of Custom House boat-house.	Do. -	Do.
PADSTOW -	In hall of residence of Chief Officer of Coastguard.	Do. -	Not recorded, because the Lifeboat Institution barometer is in general use.
PORT ISAAC -	In the coastguard boathouse -	Good -	Set, but not recorded.
BOSCASTLE -	In a wall near coastguard station -	Very good -	Recorded.
HIGHBRIDGE -	Outside door of Mr. N. G. Harden's house.	Good -	Set, but not recorded.
WESTON-SUPER-MARE.	Lifeboat house on Burnbeck Island	Very good -	Not recorded.
BRITON FERRY -	Dockmaster's office -	Do. -	Recorded.
SWANSEA -	Outside door of long room in Custom House.	Do. -	Set, but not recorded.
DUNMORE EAST -	Sent to the M.O. for repair -	- -	Since replaced by new instrument.—(R. H. Scott.)
DUNGARVAN -	On wall on the quay -	Good -	Not recorded.
CROSSHAVEN -	Inside window of rocket-house -	Very good -	Recorded.
KINSALE -	In the window of Harbour Office -	Thermometer broken. Vernier defective.	Set, but not recorded.
UNION HALL -	Outer room of watch-house -	Very good -	Recorded.
CASTLETOWNSEND -	Near watch-house door -	Do. -	Do.
BALTIMORE -	In watch-house -	Excellent -	Do.
SCHULL -	Do. -	Very good -	Recorded. Suggested that another barometer be placed on the pier.
CROOKHAVEN -	Inside outer watch-room door -	Do. -	Recorded.
DINGLE -	Outside watch-room -	Do. -	Set three times daily.
TRALEE -	In Custom House long room -	Do. -	Recorded.
TARBERT -	Coastguard watch-house -	Do. -	Set.
KILCREDAKE -	Inside watch-house -	Do. -	Set, but not recorded. Not visible to outsiders.
SPIDDAL -	In watch-room -	Good -	Recorded.
KILRONAN (ARRAN ISLAND).	Do. -	Very good -	Do.

Mr. Scott was instructed to see to the points in the above report to which Captain Toynbee had drawn special attention.

Mr. Scott reported that Captain Toynbee had spent 55 days on the inspection, and he was authorised to pay him an honorarium of 55*l.*, being the terms already arranged. (Minutes, 1888, p. 73.)

Submitted—The following :—

REPORT of INSPECTION of ENGLISH STATIONS.

TELEGRAPHIC REPORTING STATIONS.

Scilly (St. Mary's), June 26th and 27th.—Since the death of Mr. Thomas, which occurred in the early part of the year, and by which the Council have been deprived of an observer of long experience, Mr. A. Hicks has undertaken the charge of the instruments at this station. I have in previous years given him some instruction, and have recommended him as being probably the only man in the island at present capable of undertaking the work of observation. I found him to require further teaching as regards the reporting of important changes indicated by the self-registering aneroid, and also as to the setting of the verniers of the barometers, which he had lowered too much (the error thus caused having been about $-.026$ in.). He has also a slight personal error in reading both barometers and thermometers, which appeared to me to be constant and unimportant.

Perhaps I may be permitted to advert here to the interest attaching to the question whether the relatively low readings of the barometers at exposed stations on our coasts are real or only apparent, and whether, if they are real, any clear explanation can be given of the reasons of the occurrence of the phenomenon under special atmospheric conditions.

All the instruments at Scilly are in their old positions, and in good order, except that a part of the anemometer again required cleaning, and that the maximum thermometer is very difficult to set, and should therefore be exchanged for another. I think that the present observer's estimates of wind-forces of "5" and upwards, will be found to be slightly lower, in the mean, than were the estimates made by Mr. Thomas.

Prawle Point, June 29th.—I found the observer at this station, Mr. Hewitt, to read the instruments, as before, with accuracy; but some loss has been sustained by the departure of Mr. Mehegan. Mr. Hewitt will probably be himself removed from Prawle in a short time. Another of the men at this station, Mr. Macarthey, appeared to me to be an intelligent and careful observer. The station is an excellent one, but the frequent changes of personnel, common to all Coastguard stations, naturally form an obstacle to perfection in the observations. The observers at the time of my visit showed some aptitude for cirrus observations; they had, however, failed to report important changes of weather occurring between the fixed hours of observation. The instruments were in good order, but the max. reads somewhat low.

Hurst Castle, July 2nd.—The instruments at this station were found to be in a satisfactory condition. The reports of the barometer and of the highest temperature show, as in former years, occasional errors. These are certainly not due to any inability to read the instruments correctly on the part of Mr. Appleton, but he has a somewhat hasty and casual way both of handling the instruments and taking the readings, and this appears to be ineradicable. Both the winds and the state of the sea are, as I have previously remarked, affected by local causes at this station.

Dungeness, July 31st.—Mr. Curnow has left this station, and the observations are chiefly conducted by Mr. Batten. Inaccuracies still appear to occur from time to time in the barometric reports; but in my presence the light-keepers, who, as formerly mentioned, take the readings in rotation, as they are on duty, certainly read the instruments well, and all those now at the light-house give me the impression of being sober and reliable men. The muslin of the wet-bulb had not been changed with sufficient frequency.

Yarmouth, August 2nd-3rd.—The instruments at this station are in good order; but the wet-bulb is not kept sufficiently clean. The tracings of the self-registering aneroid have for a long time been too thick, in consequence of Mr. Watson's having attempted to alter the working of the pen, in order, as he told me, to "prevent the jumpings" produced in its trace. I accidentally broke off the ink-holder altogether in opening the case, which has no hinge, and was unclamped on the right-hand side. The pen has since been repaired, and the aneroid tracings are now good.

Cambridge, August 4th.—Mr. Todd was again absent from Cambridge on the day of my visit. The reports have occasionally arrived late from this station. In reply to a letter on this subject, I was informed by Mr. Todd that they were in each case handed in punctually at the telegraph office. The fault lay with the latter, and the reports now arrive punctually. The alterations made in the height of the anemometer appear to me to have been very advantageous. The dome of the observatory used formerly to obstruct southerly, and to a less extent northerly, winds, in a very appreciable degree, and the obstruction is now less serious.

The observatory is, however, considerably sheltered by trees, and, as will be noticed from the horizon-breaks in the altazimuth sketch, these trees cut off the sun's rays from the sunshine recorder in the mornings of the late autumn and the beginning of the year. The observer states that he considers that, upon the average, not more than 30 minutes are lost by reason of the trees.

I found the instruments to be all in good condition, except that there was some deposit on the hygrometer.

Loughborough, October 9th.—The observer was absent until very shortly before I left the station. Both the barometer and all the thermometers were found to be perfectly correct, and all the instruments to be attended to, as usual, with the very greatest care.

York, October 12th.—The barometric reports from this station have not appeared to be quite satisfactory, the errors being usually positive. Some of the mistakes may be due to the want of punctuality on the part of the observer, of which I have formerly complained. On the occasion of this visit, however, the observer, to my surprise, set the vernier as much as $\cdot 018$ too high. On my calling his attention to the mistake, he immediately set the vernier correctly. The thermometers are very accurate, but the muslin of the wet-bulb is not changed as frequently as the atmosphere of York requires.

Shields.—I visited North Shields on October 13th. The thermometers were removed from the old post office buildings to the telephone room of the new buildings on February 21st, 1890. Here their position is excellent, possessing several advantages which were wanting in their former site. The height of the cisterns obtained from the builder's plan is 117 feet above mean sea level. The muslin of the hygrometer had not been changed on the Saturday before my Monday's visit, the day of the week on which it is said to be usually changed. It was more foul than usual, and in the extremely smoky air of Shields a daily change would be requisite to ensure anything like freedom from dirt. The rain-gauge, as previously reported, receives occasional injuries, the inhabitants of the houses round Dockway Square, with a considerable number of children, having access to it. The instruments are otherwise in good order.

STATIONS SUPPLYING MONTHLY OR WEEKLY RETURNS.

Cirencester, July 3rd.—Professor Ohm was engaged during almost the whole of my visit, and I only obtained one or two minutes conversation with him between his lectures. The instruments are in good order. The thermometers are well mounted in an enclosure made for that purpose in the large vegetable garden on the north-west side of the College; their readings are very correct. The sunshine recorder is well mounted on the top of a large and firm stand, reached by a ladder, and its adjustments are correct. It will be seen by the altazimuth sketch, which I have sent to the Office, that sunshine is cut off during the summer solstice between 7.25 and 7.32 p.m., or thereabouts, by a dense and growing clump of trees. Trees must also slightly interfere with the sunshine in winter, both in the morning and afternoon. The instrument was shifted to its present position in the autumn of 1888. It previously occupied an excellent vantage ground at the summit of the College tower, which had to be relinquished at the orders of the Principal on account of mischief done by some of the students, who seem to have gained access to the tower.

Epsom, July 30th.—The observer was absent throughout the afternoon, and I could not, from inquiries at the College, learn where he had gone. The assistant was unfamiliar with the proper mode of treating the wet-bulb during frost, and I gave instructions on this subject. He read the instruments correctly. The muslin round the wet-bulb was somewhat stiff with lime and copper salts. The max. read $0^{\circ} \cdot 6$, or with its usual correction $0^{\circ} \cdot 4$, too low. The observations show decided improvement at this useful station.

St. Leonards, August 1st.—I regret to say that I have not changed my opinion that Mr. Colborne is not a painstaking observer. He was absent from home on the day of my visit. The thermometer screen in the Gensing gardens required repairs, and it is rather surprising that the instruments remain unbroken, considering that they are accessible to the public. As it is, the minimum had disappeared, and had been replaced by the grass thermometer, which was simply laid on the bottom of the screen. I could not obtain the corrections for the thermometers; as compared with my standards the wet-bulb required a correction of $-0^{\circ} \cdot 5$.

The sunshine recorder, which has a good exposure at the Hastings reservoir, is attended to by the keeper of the reservoir. I could not obtain access to the instrument on the day of my visit this year.

Eastbourne, August 1st.—The returns from this station continue to be satisfactory. The instruments are in excellent order. The observer attaches no muslin to the wet-bulb, but winds the wet thread of wick round the bulb. I think that it may be best to permit him to adhere to this custom.

From the altazimuth sketch which I took at the sunshine-recorder it is evident that the evening sun is cut off, principally in winter, by the range of high land, the southern extremity of which forms Beachy Head. The instrument has in other respects a perfect exposure, and the cards are carefully attended to.

A new copper rain-gauge is greatly needed at this station, the old instrument being almost entirely worn out.

Market Rasen, Tealby Vicarage, October 10th.—Since Mr. Jevons relinquished the observations at Market Rasen the instruments, with the exception of the rain-gauge, were removed by the Reverend S. Lewin to his house at Tealby, about four miles north-east of their former position. Mr. Lewin, who required some instruction in the work of observation, was necessarily absent during a considerable portion of my visit. Levelling from an O. S. mark, I found the barometer cistern to be 260.1 foot above M. S. L. The instrument, which is fastened into its wooden box, was not suspended in a satisfactory way. The thermometer screen requires some repair and repainting. I could find no convenient site for a rain-gauge.

That the observer will fill in the returns conscientiously and punctually to the best of his ability I have no doubt. Unfortunately not only are the instruments rather inconveniently placed (and there seems to be no chance of improving their position here), but the whole locality is so much obstructed by trees and buildings and characterised by such hilly and broken ground, that I hesitate to give an opinion as to its suitability, desirable as it is that some station should be found in this

neighbourhood. I should recommend that a few months' trial of the station be made, rainfall reports being had if possible from Mr. Jevons.

I have sent a rough ground plan of the position of the instruments.

York, October 12th.—The instruments at the Museum Gardens are in good order, and the observer reads the thermometers with accuracy, though he appears to be careless with his barometer. The screen is too crowded with instruments, the difference between the readings of which, when the door is closed, well exemplifies the effect of raising or lowering a thermometer-bulb in a Stevenson's screen.

The sunshine recorder was well adjusted at the date of my visit. The question whether it should be removed from the Friends School at Bootham should, in my opinion, be definitely decided in the negative. Mr. Clarke is a most able scientific teacher. The exposure at Mr. Thompson's house would not, I think, be so good, although that at Bootham is rendered imperfect by the Minster tower, an immovable obstacle and by chimneys. Further, although the wooden pedestal on which the instrument is erected, is unsteady, the school authorities are not disposed to go to the expense of erecting anything more substantial, and although it is difficult to get the instrument thoroughly well attended to in the vacations, and in term time some carelessness may be expected in the boys who occasionally have the charge of it, it is to be remembered that much is to be gained by the keeping of scientific instruments at educational establishments.

While it is easy to estimate a small present loss due to occasional clumsy manipulation, it is difficult to set too high a value on the possible acquisition of a taste for meteorological observation at our schools, and at such institutions as Epsom College, Cirencester, Cooper's Hill, &c. And if I may here be permitted such a digression, I think that the downward percolation of science is so great, that one lecture at a public school is worth very many at a fishery station.

Seaham, October 13th.—The barometer was moved October 11, 1889 (since last year's inspection), from its rather inconvenient position in Mr. Aird's house to a good site in the residence of Mr. Leith at the cemetery grounds. The observations are all taken by Mr. Leith, who seemed inclined to set the vernier of the barometer somewhat low, but is accurate and careful in his readings of the thermometers. All corrections and reductions are still made by Mr. Aird, with whom I had no interview on the day of my visit, as he was absent at his new residence, about six miles from the station. As might perhaps be expected, some inaccuracies have been noticeable in the returns. The max. read 1° too low. The screen has been repaired and repainted. All the instruments were found to be in good order. The present level of the barometer cistern is given as 150 feet. I question whether this is not 1 or 2 feet too high.

Stokesay, October 17th.—The barometric returns from this station have for a long period been questionable. All the instruments are usually read carefully, as I think, by Miss La Touche, but at times the readings are taken by some of Mr. La Touche's young pupils, and I think that the barometer may occasionally be handled with insufficient care. I dislodged a small bubble of air from the tube, but after this had been done the mercury appeared to stand 0.27 too low. The thermometer screen is home-made and of peculiar but not unsatisfactory type. I requested that it should be repainted and have some slight necessary repairs. I also advised that the grass minimum, which is new, but out of order, should be exchanged for another instrument. A good solar radiation thermometer is in use here now. As I have formerly observed, the wind at this station is very greatly affected by the hills. I have reason to fear that the station will not be permanently maintained.

Sutton Coldfield, October 18th.—Since my last inspection the thermometer screen and rain-gauge have been removed to the observer's garden, where they have a satisfactory position. The barometer, an instrument on the Fortin principle, is by Bailey, of Birmingham, and has no error throughout the scale. It has not been removed from its former position on the ground floor of the borough offices. All the instruments are in good order, and appear to be well attended to, but some inaccuracies and omissions have been observed in the returns. I think improvement may be expected.

I inspected the following FISHERY BAROMETER STATIONS, with rather disappointing results :—

Hull.—I examined the fishery barometer at noon of October 11th. The number of this instrument, which was supplied in 1853, is B. T. 17. The level of the cistern is 7 feet above M.S.L. I found the instrument (at 30.270) to have a somewhat large error, requiring the correction of $+0.074$, but the tube to contain no air. The foreman at the Humber Dock is in charge of the instrument, which he reads fairly correctly, but does not understand. The readings are sent in daily to the principal dockmaster's office, but are, as I was told, made no further use of. I think that the instrument attracts but little attention, except from a stray loiterer at the docks.

Withernsea.—I had selected Saturday as the most convenient day for lecturing to the fishermen at this station, and had written to Mr. John Ward, who is in charge of the instrument, on the subject. On my arrival, however, I found that there are only ten fishermen here, all of whom had gone to a fair at Hull. The barometer, B.T. 76, which was supplied in 1863, is affixed to the outside wall of what was formerly Mr. Ward's shop. I examined the instrument at 3 p.m. of the 11th, and found it, with a reading of 30.179 , to require a correction of $+0.017$. The instrument, however, appeared to be free from air. The altitude of the cistern was given me by Mr. Ward as 20 feet above M.S.L., but, having plenty of time, I levelled and found it to be 22.3 feet. I could not elicit from Mr. Ward any tokens of intelligence as to the use of the instrument, neither do I think that the fishermen at this desolate spot employ it much.

(Signed) W. CLEMENT LEY.

October 21, 1890.

STATION.	NAME OF STATION.	BAROMETER.	THERMOMETERS.												General State of Station.	STATION.		
			Tempera- ture of Water.	DRY BULB.		WET BULB.		MAXIMUM.		MINIMUM.		SPARE.		GRASS.				
				Correction to reduce to Inspec- tor's Standard.	Correction hitherto applied.	Correction to reduce to Inspec- tor's Standard.	Correction hitherto applied.	Correction to reduce to Inspec- tor's Standard.	Correction hitherto applied.	Correction to reduce to Inspec- tor's Standard.	Correction hitherto applied.	Correction to reduce to Inspec- tor's Standard.	Correction to reduce to Inspec- tor's Standard.	Correction hitherto applied.			Condition of Hygro- meter.	
Cambridge	-	- '003	64	0	-0.1	0	0	0	-0.4	0	+0.5	-	0	-	0	B	Cambridge.	
Cirencester	-	-	60	0	+0.1	-	0	0	-0.1	-	-0.1	-	-	-	0.0	B	Cirencester.	
Dungeness	-	+ '001	60	0	0	-	-	-	0.0	-	-0.1	-	-	-	-	B	Dungeness.	
Eastbourne	-	-	70	0	0	-	-	-	+0.1	-	0.0	-	-	-	-	A	Eastbourne.	
Epsom	-	- '002	57	0	-0.25	-0.1	-	-	+0.6	+0.2	+0.4	-	-	-	+0.35	A	Epsom.	
Hurst Castle	-	'000	59	0	-0.15	-	-	-	-0.15	-	-0.3	-	-	-	-	A	Hurst Castle.	
Loughborough	-	-	55	0	+0.05	-	-	-	0.0	-	+0.05	-	+0.05	-	-	A	Loughborough.	
Market Rasen	-	- '002	53	0	+0.1	-	-	-	-0.4	-	+0.7	-	+0.4	-	-	B	Market Rasen.	
Praxle Point	-	- '002	58	0	-0.1	-	-	-	+0.5	-	+0.4	-	-0.1	-	-	A	Praxle Point.	
St. Leonards	-	-	66	0	-0.2	-	-	-	0.0	-	-	-	-	-	+0.4	B	St. Leonards.	
Scilly	-	- '020	55	0	0	-	-	-	-0.7	-	+0.2	-	0.0	-	-	A	Scilly.	
Seaham	-	- '002	55	0	0	-	-	-	+1.0	+0.5?	0.0	-	-	-	-	A	Seaham.	
Shields	-	+ '002	57	0	0	-	-	-	-0.2	-	+0.1	-	-	-	-	B	Shields.	
Stokesay	-	+ '001	52	0	+0.1	-0.1	-0.2	-0.4	-0.1	-0.3	+0.3	-0.3	-	-	-	A	Stokesay.	
Sutton Coldfield	-	+ '004	-	-	-	-	-	-	-	-	-	-	-	-	-	B	Sutton Coldfield.	
Yarmouth	-	- '001	66	-	-0.35	-	-	-	+0.15	-	+0.35	-	-	-	-	B	Yarmouth.	
York	-	+ '018	58	0	0	-	-	-	-0.2	-	+0.2	-	-	-	-	B	York.	
York	-	+ '018	58	0	0	-	-	-	+0.1	-	+0.4	-	-	-	-	B	York.	

Mr. Scott reported that on the completion of the transfer of Heligoland to the German authorities, he had, with the Chairman's sanction, written on August 2nd to Dr. Neumayer (P.C. 1441) inquiring if the Deutsche Seewarte wished to purchase the instruments on the island.

Read—Letter 1617 from Dr. Neumayer declining most of the instruments, but asking the price of the anemometer.

Mr. Scott stated that he had directed the observer to return the barometer, &c., and he was instructed to state the original cost of the anemometer to Dr. Neumayer. (P.C. 1909.)

Submitted—The following report (M.O. 1867) (Minutes, p. 29):—

SPECIAL SERVICES in behalf of METEOROLOGICAL COUNCIL.

In computing the daily amount of salary, the year is taken as 313 days.

Salaries.—Mr. Whipple on inspection duty:—

		£	s.	d.	£	s.	d.
1888.	28½ days at 25s. 6d. per day	-	-	36	6	9	
1889.	18 " "	-	-	22	19	0	
1890.	31 " "	-	-	39	10	6	
" Mr. Baker on inspection duty:—							
1888.	20 days at 16s. per day	-	-	16	0	0	
1889.	17 " "	-	-	13	12	0	
1890.	25 " "	-	-	20	0	0	
	Fort William Observatory.						
1890.	24 days at 16s. per day	-	-	19	4	0	
				£167	12	3	

Average per year	-	-	-	-	-	55	17	6
Maintenance of electrograph per year*	-	-	-	-	-	40	1	2
Observing solar and terrestrial radiation thermometer	-	-	-	-	-	9	0	0
				£104 18 8				

Other Work done during 1888-1890.

	£	s.	d.
Nipher's snow-gauge read daily from January 1888 to March 1889 at 3d. per day	-	-	5 12 6
Comparison of Falmouth rain-gauge, 7 months at 3d. daily	-	-	2 12 6
Time of two assistants in unpacking, erecting, determining constants, dismounting and repacking Fort William instruments	-	-	7 0 0
£15 5 0			

* NOTE:—

	£	s.	d.
One-eighth of Morgan and Kidd's account for photo. paper and chemicals	-	3	5 8
Proportion of gas consumed	-	4	9 6
One-eighth of photographer's time	-	5	0 0
Time of attendants occupied in daily maintenance of instrument at 1s. 6d. per hour	-	27	6 0
£40 1 2			

Submitted—The following summary, as a result of the primary checking of the storm warnings issued to the coasts of the British Islands since the last meeting of the Council:—

1. WARNINGS ISSUED.

SUMMARY.

A + B (successful)	-	-	-	=	87
C (failures)	-	-	-	=	31

2. GALES EXPERIENCED, BUT FOR WHICH NO WARNINGS WERE ISSUED.

None.

(Signed) FREDK. J. BRODIE
for
FREDC. GASTER.

Telegraphic Branch,
October 29, 1890.

Submitted—The following reports on the 8.30 p.m. forecasts for July, August, and September 1890 :—

The letters used have the following signification :—

a=complete success.

b=partial (i.e. more than half) success.

c=partial failure.

d=total failure.

JULY.

DISTRICTS.		Per-centages.			Per-centage of Success. a + b.
		Wind.	Weather.	Average Forecast.	
SCOTLAND, N.	a	36	60	48	81
"	b	32	34	33	
"	c	19	3	11	
"	d	13	3	8	
SCOTLAND, E.	a	35	44	40	74
"	b	26	43	34	
"	c	23	13	18	
"	d	16	0	8	
ENGLAND, N.E.	a	39	44	42	79
"	b	42	33	37	
"	c	13	13	13	
"	d	6	10	8	
ENGLAND, E.	a	36	42	39	76
"	b	35	39	37	
"	c	29	13	21	
"	d	0	6	3	
MIDLAND COUNTIES	a	39	47	43	84
"	b	48	33	41	
"	c	10	10	10	
"	d	3	10	6	
ENGLAND, S.	a	52	45	49	88
"	b	39	39	39	
"	c	6	10	8	
"	d	3	6	4	
SCOTLAND, W.	a	42	36	39	78
"	b	32	45	39	
"	c	16	13	14	
"	d	10	6	8	
ENGLAND, N.W.	a	52	49	51	89
"	b	35	42	38	
"	c	3	6	5	
"	d	10	3	6	
ENGLAND, S.W.	a	39	29	34	75
"	b	29	52	41	
"	c	16	6	11	
"	d	16	13	14	
IRELAND, N.	a	29	39	34	86
"	b	48	55	52	
"	c	10	3	6	
"	d	13	3	8	
IRELAND, S.	a	23	36	30	75
"	b	39	52	45	
"	c	22	6	14	
"	d	16	6	11	
SUMMARY.					
BRITISH ISLES	a	38	43	41	80
"	b	37	42	39	
"	c	15	9	12	
"	d	10	6	8	

Submitted—The following report on the 8.30 p.m. forecasts for August 1890 :—

The letters used have the following signification :—

a=complete success.

b=partial (i.e. more than half) success.

c=partial failure.

d=total failure.

AUGUST.

DISTRICTS.		Per-centages.			Per-centage of Success a + b.
		Wind.	Weather.	Average Forecast.	
SCOTLAND, N.	a	45	49	47	78
"	b	29	32	31	
"	c	10	13	11	
"	d	16	6	11	
SCOTLAND, E.	a	42	55	49	74
"	b	19	32	25	
"	c	26	7	17	
"	d	13	6	9	
ENGLAND, N.E.	a	55	52	54	88
"	b	32	36	34	
"	c	10	6	8	
"	d	3	6	4	
ENGLAND, E.	a	61	55	58	87
"	b	23	35	29	
"	c	16	10	13	
"	d	0	0	0	
MIDLAND COUNTIES	a	55	52	54	84
"	b	32	29	30	
"	c	13	13	13	
"	d	0	6	3	
ENGLAND, S.	a	58	65	62	87
"	b	32	19	25	
"	c	7	10	9	
"	d	3	6	4	
SCOTLAND, W.	a	52	55	54	81
"	b	23	32	27	
"	c	16	13	15	
"	d	9	0	4	
ENGLAND, N.W.	a	52	49	51	88
"	b	35	39	37	
"	c	10	6	8	
"	d	3	6	4	
ENGLAND, S.W.	a	58	55	57	84
"	b	26	29	27	
"	c	10	16	13	
"	d	6	0	3	
IRELAND, N.	a	32	49	41	73
"	b	29	35	32	
"	c	23	10	16	
"	d	16	6	11	
IRELAND, S.	a	26	45	36	81
"	b	39	52	45	
"	c	22	0	11	
"	d	13	3	8	
SUMMARY.					
BRITISH ISLES	a	49	53	51	83
"	b	29	34	32	
"	c	15	9	12	
"	d	7	4	5	

Submitted—The following report on the 8.30 p.m. forecasts for September 1890 :—

The letters used have the following signification :—

a=complete success.

b=partial (*i.e.* more than half) success.

c=partial failure.

d=total failure.

SEPTEMBER.

DISTRICTS.		Per-centages.			Per-centage of Success. a + b.
		Wind.	Weather.	Average Forecast.	
SCOTLAND, N.	a	37	44	41	79
"	b	37	40	38	
"	c	23	13	18	
"	d	3	3	3	
SCOTLAND, E.	a	54	57	56	82
"	b	20	33	26	
"	c	23	10	17	
"	d	3	0	1	
ENGLAND, N.E.	a	60	50	55	92
"	b	37	37	37	
"	c	3	10	7	
"	d	0	3	1	
ENGLAND, E.	a	63	47	55	87
"	b	30	33	32	
"	c	7	7	7	
"	d	0	13	6	
MIDLAND COUNTIES	a	50	60	55	89
"	b	40	27	34	
"	c	10	7	8	
"	d	0	6	3	
ENGLAND, S.	a	64	60	62	91
"	b	33	24	29	
"	c	3	13	8	
"	d	0	3	1	
SCOTLAND, W.	a	47	40	44	86
"	b	37	47	42	
"	c	16	7	11	
"	d	0	6	3	
ENGLAND, N.W.	a	57	53	55	90
"	b	33	37	35	
"	c	10	7	9	
"	d	0	3	1	
ENGLAND, S.W.	a	30	47	39	84
"	b	50	40	45	
"	c	13	10	11	
"	d	7	3	5	
IRELAND, N.	a	30	43	37	79
"	b	37	47	42	
"	c	17	3	10	
"	d	16	7	11	
IRELAND, S.	a	27	33	30	69
"	b	27	50	39	
"	c	40	10	25	
"	d	6	7	6	
SUMMARY.					
BRITISH ISLES	a	47	48	48	84
"	b	35	38	36	
"	c	15	9	12	
"	d	3	5	4	

Submitted—The following statements of work during the three months ended September 30 :—

MARINE BRANCH.

October 28, 1890.

Examined 36 new logs and 5 lighthouse registers.

Discussion of the observations in the district between the Cape of Good Hope and New Zealand.

The monthly charts of sea temperature, &c., for the neighbourhood of Cape Guardafui lithographed and proofs examined.

Annual monthly cyclone track charts, 18 sheets, lithographed and proofs examined.

Revising proofs of "Instructions for keeping a Meteorological Log."

Examined the lithographed proofs of chart of cyclone tracks in the Bay of Bengal in May and June 1885; pressure charts for new issue of Barometer Manual; and a corrected variation chart and plate of cloud forms for insertion in the "Instructions for keeping a Meteorological Log."

Charting ocean currents from the remark books of Her Majesty's ships. For this work 1,659 volumes were received from the Hydrographic Department during the three months.

(Signed) CHAS. HARDING.

The Marine Superintendent.

Forwarded for the information of the Council,

(Signed) C. W. BAILLIE.

TELEGRAPHIC (FORECAST AND STORM WARNING) BRANCH.

(To 30th September 1890.)

Monthly Weather Report, 1887.—May to October in proof; November partly written.

Monthly Summary, 1890.—January to April published; May to August partly prepared.

Weekly Weather Report, 1890.—All numbers issued to date; all appendices well in hand. Part 2 of Appendix I. is issued.

Daily Weather Report, 1890.—All numbers issued to date; correction and addition sheets, to that for August, issued.

Checking of Daily Forecasts.—Well up to date.

Primary Checking of Storm Warnings issued since end of July.—All checked.

The summer vacation is now nearly over, but during its continuance little has been done beyond the ordinary daily routine work.

(Signed) FREDC. GASTER.

PANTAGRAPH ROOM.

October, 1890.

Hourly Readings.

The calculation of the mean values and the preparation of the tables for 1887 has been completed and is ready for the printer. A portion of it has been put in type in order to decide upon the best arrangement of the tables, and since then one section, Valencia, has been finally set up and the proof read and passed for press.

The Greenwich tables in "Harmonic Analysis of Hourly Readings at British Observatories" have been sent to the printer; the form of the publication has been decided upon, and the Greenwich section is now ready for press. The preparation of the tables for the seven observatories is now in hand.

Some work has been done upon the Kew means for 1889-90.

The usual work of the room has been kept up to date.

(Signed) R. H. CURTIS.

R. H. Scott, Esq., F.R.S.

EXAMINATION BRANCH.

October 29, 1890.

Examinations.

June to September, 1890.—Examination of the work from all observatories, completed.

Special examination of the work from Fort William Observatory.

Weekly examination (on receipt) of the curves and documents from all observatories.

Reports.

January to June, 1890.—Report on the work to Council.

June to September, 1890.—Copies of the "Notes of Errors" to all observatories, and monthly report thereon.

Miscellaneous.

The Diurnal Range of Rainfall, 1881-90.—The preparation of forms, extraction of observations, and the computations, and checking thereof, have been completed for Valencia (to 1889), Armagh (to 1886, and extractions to 1888), Falmouth, Kew, and Aberdeen (to 1886), Stonyhurst and Glasgow (to 1883).

Partial checking of the scale values of Fort William barograph and thermograph.

The preparation of notes for the annual inspections.

Revising and correcting Forms No. 22 (Barograph Tabulation Sheet) and No. 23 (Thermograph Tabulation Sheet).

Various items, such as changing the notice boards on the balcony and delivery of the weather forecasts by Mr. Parsons, and the covering of each month's documents by Mr. Hewitt, have occupied a considerable amount of time, in addition to which the principal portion of the annual vacation has been taken by the staff during the period under notice.

(Signed) T. E. ALLEN.

Submitted—The following statement of accounts for the six months ending 30th September 1890 :—

INCOME.			EXPENDITURE.		
	£	s. d.		£	s. d.
Balance from year 1888-89	-	-	ADMINISTRATION :		
Proportion of vote	-	-	Payment of Council	500	0 0
Repayment of expenses charged under—			Secretary	400	0 0
(1.) Incidental expenses	7	10 2	Salaries and wages	394	7 0
(2.) Special researches	1	7 3	Rent, fuel, and lighting	356	10 10
(3.) Observatories	7	18 0	Furniture and fittings	301	10 10
(4.) International meteorology	4	4 0	Incidental and contingent expenses	210	13 1
		20 19 5	Expenses incidental to International Meteorological Congress	7	6 0
SUPPLY OF WEATHER INFORMATION :			Pensions	93	8 2
D.W. Charts and Forecasts	137	3 9			2,263 15 11
6 p.m. Charts	12	10 0	SPECIAL RESEARCHES	-	-
Information for Press Agencies, &c.	53	10 8			353 8 9
Telegrams	77	16 1	LAND METEOROLOGY :		
		281 0 6	Observatories and stations	1,020	9 0
SALE OF INSTRUMENTS, &c. :			Discussion and reduction of observations	762	4 0
Royal Navy account - Mercantile Marine account	27	5 6			1,782 13 0
	33	8 7	WEATHER INFORMATION AND FORECASTS :		
		60 14 1	Telegraphic reports and storm warnings	1,166	14 0
Commission charged on work done for Colonies, &c.	-	-	Preparation and issue of reports and forecasts	904	9 1
		29 15 2			2,071 3 1
			INSPECTIONS :		
			Salaries and travelling	-	-
					*333 13 8
			OCEAN METEOROLOGY :		
			Discussion and reduction of observations	804	0 0
			Expenses incidental to the supply of instruments :		
			Proportion for care and issue of instruments	100	0 0
			Royal Navy	270	4 10
			Mercantile Marine	90	10 3
			Distant island and coast stations	2	13 1
					1,267 8 2
			Balance	-	-
					2,689 0 3
		£10,761 2 10			£10,761 2 10
LIABILITIES.			ASSETS.		
	£	s. d.		£	s. d.
To Council	500	0 0	By cash at Bank	3,446	14 8
„ contracts or work uncompleted	495	9 6	„ „ at Office	86	4 7
„ Post Office (estimated)	275	0 0	„ sundry debtors	284	3 9
„ sundry creditors	507	13 3	„ H.M. Exchequer	650	0 0
„ balance	2,689	0 3			
	£4,467	3 0			£4,467 3 0

* Some expenses under this head not yet brought to account.

Mr. Scott was instructed to write to the Admiral Superintendent of Naval Reserves as to the change of sea temperature station from Claggan to Blacksod. (P.C. 1882.)

Mr. Scott was also instructed to make further inquiries from Mr. Cullum as to Westwood House, Cahirciveen. (P.C. 1899.)

Reported—That forecasts, &c. had been supplied as in previous years to the Admirals commanding the several fleets in the recent manœuvres. (Letters 1440 and 1442.)

Read—A memorandum from Mr. Baillie, stating that since last meeting 43 logs had been received, 33 of them being “excellent.”

Mr. Scott was instructed to present the charts (O. 27) to Captains T. S. Angus, T. Garnsworthy, R. W. Trenaman, and Lieutenant E. A. Day, and to convey the best thanks of the Council to the other observers.

Read—Letter 1790 from Lieutenant G. C. Frederick, H.M.S. “Dart,” recommending the loan of instruments to an observer in the New Hebrides (Minutes, 1889, p. 51).—Supply sanctioned.

Submitted—The following list of publications which had been received since the last meeting :—

- Edinburgh, Royal Society.*—Proceedings, Vols. XV.–XVI.
Turin, Società Meteorologica Italiana.—Atti della terza assemblea generale della Soc. Meteor. Ital. tenuta a Venezia dal 14 al 22 Settembre 1888.
Upsala, Observatoire Météorologique.—Bulletin mensuel. 1889.
FitzGerald, G. F., and Cullum, J. E.—Reports on the magnetic observations at Valentia.
Eliot, J.—On the occasional inversion of the temperature relations between the hills and plains of Northern India.
Schück, A.—Neuere Kompassrosen, ihre Entwicklung, Grundzüge und Prüfung für den Gebrauchswert auf See. (Fortsetzung).
Lorenz-Liburnau, J. Ritter von.—Resultate forstlich-meteorologischer Beobachtungen insbesondere in den Jahren 1885–87. I. Theil.
Calcutta, Meteorological Office.—Report on the meteorology of India in 1888.
 ——— Report on the administration of the Meteorological Department of the Government of India in 1888–89.
 ——— Hand-book of cyclonic storms in the Bay of Bengal. For the use of sailors. By J. Eliot.
 ——— Cyclonic memoirs. Part ii. Bay of Bengal cyclone of August 21st–28th, 1888.
Christiania, Norwegisches meteorologisches Institut.—Jahrbuch, 1888.
 ——— Oversigt over Luftens Temperatur og Nedbøren i Norge. 1888, 1889.
Utrecht, K. Nederlandsch meteorologisch Instituut.—Jaarboek, 1889.
 ——— Onweders in Nederland. 1889.
Snellen, M.—Buys Ballot. (Obituary Notice.)
Ragana, D.—Eliofotometro del R. Osserv. di Modena.
 ——— Relazioni tra i principali elementi meteorologici.
 ——— Sui massimi e minimi barometrici nei mesi invernali.
 ——— Rivista meteorica della provincia di Modena per l'anno 1889.
Spoerer, G.—Ueber die Periodicität der Sonnenflecken seit dem Jahre 1618.
Halle, Leopoldino-carolinische deutsche Akad. der Naturforscher.—Leopoldina. 1889.
Symons, G. J.—British rainfall. 1889.
Paris, Observatoire Municipal de Montsouris. Annuaire. 1890.
Rio de Janeiro, Imperial Observatorio.—Annaes. Tomo IV. Parts i.–ii.
 ——— Annuario. 1888–90.
Waters, A. W.—Some meteorological conditions of Davos.
Washington, Smithsonian Institution.—Annual report. 1887. Part i.
Santiago, Observatorio Astronómico.—Observaciones meteorológicas. 1885–1887.
Trieste, Osservatorio Marittimo.—Rapporto annuale contenente le osservazioni meteorologiche per l'anno 1887.
Pesth, K. Ung. Central-Anstalt für Meteorologie.—Jahrbuch. 1887.
Stockholm, Kongl. Svenska Vetenskaps-Akademie.—Meteorologiska iakttagelser i Sverige. 1885.
Scott, R. H.—Thunderstorms.
Calcutta, Meteorological Office.—Memorandum on the snowfall in the mountain districts of Northern India and Afghanistan and the abnormal features of the meteorology of India during the period January to May, 1890.
Rajna, M., e Porro, F.—Determinazione della differenza di longitudine tra gli osservatorii astronomici di Milano e di Torino mediante osservazioni fatte nel 1885.
Hamburg, Deutsche Seewarte.—Resultate meteorologischer Beobachtungen von Deutschen und Holländischen Schiffen für Eingradfelder des Nordatlantischen Ozeans. Quadrat 76. No. VIII.
Mauritius, Royal Alfred Observatory.—Annual report. 1888.
San Fernando, Instituto y Observatorio de Marina. Anales. 1889.

- Paris, Comité International des Poids et Mesures.*—Procès-Verbaux des séances de 1889.
- Cape of Good Hope, Meteorological Commission.*—Report. 1889.
- Peking, Inspectorate General of Customs.*—Medical reports for the half year ended 31st March 1888.
- London, Board of Trade.*—Abstracts of the returns of shipping casualties. 1888–89.
- Madrid, Observatorio.*—Observaciones meteorológicas efectuadas en el Observatorio de Madrid durante los años 1888 y 1889.
- Resumen de las observaciones meteorológicas efectuadas en la Peninsula y algunas de sus islas adyacentes durante el año de 1886.
- Hayden, E.*—The law of storms considered with special reference to the North Atlantic.
- Lisbon, Observatorio Do Infante D. Luiz.*—Annaes. XXV. 1887.
- Prague, Technisches Bureau des Landesculturrathes für das Kön. Böhmen.*—Ergebnisse der Wasserstandsbeobachtungen an den Flüssen Böhmens. 1889.
- Ergebnisse der ombrometrischen Beobachtungen in Böhmen. 1889.
- Lahore, Sanitary Commissioner.*—Report on the sanitary administration of the Punjab. 1889.
- Santillan, R. A.*—Apuntes relativos á algunos observatorios é institutos meteorológicos de Europa.
- Wollny, E.*—Untersuchungen über das Verhalten der atmosphärischen Niederschläge zur Pflanze und zum Boden.
- Platzer, S. P.*—Sulla straordinaria quantità di neve negli anni 1836 e 1888.
- Calcutta, Meteorological Office.*—Summary of the meteorology of the year 1889.
- Hamburg, Deutsche Seewarte.*—Aus dem Archiv der Deutschen Seewarte. 1889.
- Schönrock, A.*—Specielle Untersuchung der Gewitter in Russland im Jahre 1888.
- Mütrich, A.*—Ueber den Einfluss des Waldes auf die periodischen Veränderungen der Lufttemperatur.
- Allahabad, Meteorological Office.*—Brief sketch of the meteorology of the North-Western Provinces and Oudh, and adjacent parts of Rájputana and the Panjáb, 1889.
- Brezina, A.*—Die Meteoritensammlung des K. K. mineralogischen Hofkabinetes in Wien am 1 Mai 1885.
- London, Meteorological Office.*—Meteorological observations at Stations of the Second Order for the year 1886.
- Prague, K. K. Sternwarte.*—Magnetische und meteorologische Beobachtungen. 1889.
- Singapore, Principal Civil Medical Officer.*—Annual meteorological report, Straits Settlements, for the year 1889.
- Straits Settlements.*—Annual report of the State of Selangor. 1889.
- Perak. 1889.
- Negri Sembilan. 1889.
- Sungei Ujong and Jelebu. 1889.
- Hann, J.*—Das Luftdruck-Maximum vom November 1889 in Mittel-Europa, nebst Bemerkungen über die Barometer-Maxima im Allgemeinen.
- Bemerkungen über die Temperatur in den Cyklonen und Anticyklonen.
- Wild, H.*—Neuer Anemograph und Anemoscop.
- Ombrograph und Atmograph.
- Harding, C.*—The cold period at the beginning of March, 1890.
- Gratz, Naturwissenschaftlichen Verein für Steiermark.*—Mittheilungen. 1889.
- Hobart, Royal Society of Tasmania.*—Papers and Proceedings. 1889.
- Manchester, Literary and Philosophical Society.*—Memoirs and Proceedings. Vol. III., 4th series.
- St. Petersburg, Physikalisches Central-Observatorium.*—Annalen. 1889. Theil I.
- Washington, United States Naval Observatory.*—Washington Observations for 1885, Appendix I.
- The International Astrophotographic Congress and a visit to certain European Observatories and other Institutions.
- Jenkins, B. G.*—The British astronomical weather almanac, 1891.

63, Victoria Street, November 12, 1890.

PRESENT :

LIEUT.-GENERAL STRACHEY IN THE CHAIR.

MR. GALTON.

|

MR. STONE.

THE HYDROGRAPHER.

The Secretary was in attendance.

The Minutes of the last meeting (October 29) were read and confirmed.

Mr. Scott reported that Mr. Baillie and he himself had been placed on the Navigation Committee of the proposed Naval Exhibition (Letter 1885). He stated that he would submit a detailed list of proposed exhibits at next meeting, and was authorised to have a set of the working current charts framed and glazed for exhibition, on condition that the work of plotting the currents was not delayed thereby.

Reported—That copies of the meteorological observations from H.M.S. "Erebus" and "Terror," 1839-42, and from H.M.S. "Chanticleer," 1829-31, had been presented to the Office by the Admiralty (Letter 1934).

Mr. Scott was instructed to obtain a report from Mr. Strachan on these records.

Submitted—The following statements of work during the month of October :—

MARINE BRANCH.

November 11, 1890.

Examined 5 new logs.

Discussion of the observations in the district between the Cape of Good Hope and New Zealand.

Adding explanatory and other notes to the monthly charts of sea temperature, &c., for the neighbourhood of Cape Guardafui, and drawing a sheet containing 12 generalized charts on a small scale.

Passed for press 18 sheets containing monthly and annual cyclone tracks for the South Indian Ocean.

Preparing diagrams representing the instrumental results for the Red Sea discussion; considering the desirability of representing the frequency of winds of gale force; and adding the islands to the current charts.

Received revised proofs of the variation chart for insertion in the "Instructions for keeping a Meteorological Log," and of January and July isobars for the Barometer Manual.

Charting ocean currents from the Remark Books of H.M. ships. 556 volumes were received from the Hydrographic Department for this work during the month.

(Signed) CHAS. HARDING.

The Marine Superintendent.

Forwarded for the information of the Council.

(Signed) C. W. BAILLIE.

TELEGRAPHIC (FORECAST AND STORM WARNING) BRANCH.
(To 31st October 1890.)

Monthly Weather Report, 1887.—All written and in printers' hands. Proofs received up to September. Revision of these to be undertaken at once.

Monthly Weather Summary, 1890.—Materials for September ready; otherwise same as at date of last report.

Weekly Weather Report, 1890.—All numbers issued promptly. Appendices, &c. well up to date.

Daily Weather Report, 1890.—All numbers issued promptly to date. Correction and Addition Sheet for September issued.

Primary Checking of Storm Warnings.—Done to date.

Checking of Hay Harvest Forecasts, 1890.—Commenced.

Preparation of New Instructions in Meteorological Telegraphy.—Copy (in rough) prepared, and now in proof.

Some more of the Summer vacations have been cleared off during this month, and for four days I have been in attendance at the Court of Queen's Bench, on subpoena.

(Signed) FREDC. GASTER.

Telegraphic Branch,

November 1890.

Submitted—The following memoranda :—

MATERIALS for preparing ESTIMATES for 1891-92.

	Actual Expenditure 1889-90.	Estimated Expenditure 1891-92.	Proposed for 1891-92.	Voted for 1890-91.
Administration :	£	£	£	£
(1.) Council - - - - -	-	1,000	1,000	1,000
(2.) Secretary - - - - -	-	800	800	800
(3.) Salaries : - - - - -	-	790	780	780
Chief Clerk - - - - -	333			
1 Junior Clerk - - - - -	200			
2 unclassified clerks - - - - -	96			
Office Keeper - - - - -	109			
Messengers - - - - -	63			
	801			
Deduct, present salaries being less - - - - -	11			
	790			
(4.) Rent, fuel, and lighting - - - - -	-	714	720	720
Rent - - - - -	635			
Fuel - - - - -	57			
Gas - - - - -	22			
	714			
(5.) Incidental and contingent expenses - - - - -	-	475	420	420
Office Keeper's contingent account, including porter's allowance for cleaning, &c. - - - - -	197			
Postage - - - - -	56			
Furniture and Office repairs - - - - -	155			
Carriage of parcels, &c. - - - - -	16			
Copying synchronous observations - - - - -	6			
Books and printing - - - - -	33			
Sundries (including International Meteorology) - - - - -	47			
	510			
Deduct repayments under this head, including "Commission" - - - - -	35			
	475			
(6.) Pensions - - - - -	-	187	190	190
Capt. H. Toynbee - - - - -	144			
Mr. J. S. Harding, senr. - - - - -	43			
Special Researches and Experiments - - - - -	-	1,000	1,000	1,000
(1.) Researches :				
Bridled anemometer (Holyhead) - - - - -	10			
Cloud experiments - - - - -	28			
Sunshine cards, &c. - - - - -	35			
Electrical anemometer - - - - -	79			
Discussing R.E. and other observations - - - - -	32			
Dines's anemometer experiments - - - - -	7			
Calculation of hourly means - - - - -	106			
Sundries - - - - -	7			
	304			
(2.) Salaries :				
1 Junior Clerk - - - - - £140				
Female staff - - - - - £234				
	374			
Add, present salaries more, and increments authorised - - - - - £78	678			
Transfer from head <i>Land Meteorology</i> , § 2 - - - - - £250	328			
	1,006			
Carried forward - - - - -	-	4,966	4,910	4,910

	Actual Expenditure 1889-90.	Estimated Expenditure 1891-92.	Proposed for 1891-92.	Voted for 1890-91.
Brought forward - - -	£ -	£ 4,966	£ 4,910	£ 4,910
<i>Land Meteorology :</i>				
(1.) Observatories and stations - - -	- - -	2,235	2,250	2,250
Aberdeen - - -	276			
Armagh - - -	50			
Ben Nevis - - -	100			
Falmouth - - -	250			
Glasgow - - -	75			
Kew - - -	400			
Stonyhurst - - -	55			
Valencia (including rent) - - -	515			
Anemograph stations - - -	60			
Meteorological Societies (Observations 2nd Order) -	107			
Instruments - - -	41			
Sundries - - -	25			
	1,954			
Additional charge on observations from Stations 2nd Order - - -	31			
Fort William Observatory - - -	250			
	2,235			
(2.) Salaries :—Discussion and reduction of observations -	- - -	1,214	1,200	1,250
2 Senior Clerks - - -	505			
6 Junior Clerks - - -	760			
5 Unclassified Clerks - - -	216			
	1,481			
Deduct (1) present salaries being less after allowing for increments authorised £17				
„ (2) sum to be charged against Special Researches - - - 250				
	267			
	1,214			
<i>Weather Information and Forecasts - - -</i>	- - -	2,027	2,030	2,080
(1.) Telegraphic reports and storm warnings :—				
Reports from inland stations - - -	587			
Reports from abroad - - -	99			
Reports sent abroad - - -	402			
Storm warnings - - -	248			
Hay harvest forecasts - - -	30			
Private wires - - -	91			
Payments to reporters, &c. - - -	688			
Reports to Jersey - - -	31			
Sundry telegrams, forecasts, &c. - - -	17			
Postage of charts and incidental expenses -	240			
Instruments, &c. - - -	33			
Wrappers, printing, &c. - - -	23			
U.S. Reports - - -	12			
Weekly Reports and Sundries - - -	47			
	2,548			
Deduct :—				
Repayments during the same period - £478				
U.S. Reports discontinued - - - 12				
Jersey „ „ - - - 31				
	521			
	2,027			
Carried forward - - -	- - -	10,442	10,390	10,490

	Actual Expenditure 1889-90.	Estimated Expenditure 1891-92.	Proposed for 1891-92.	Proposed for 1890-91.
	£	£	£	£
Brought forward - - - - -	- -	10,442	10,390	10,490
(2.) Salaries :—Preparation and issue of reports and forecasts - - - - -	- -	1,825	1,800	1,800
1 Senior Clerk (9 hours daily) - - - - -	309			
7 Junior Clerks (5 work 9 hours daily) - - - - -	1,101			
2 Unclassified Clerks - - - - -	102			
1 Messenger - - - - -	65			
Addition for late evening and Sunday attendance - - - - -	211			
	1,788			
Add for present salaries and increments authorised - - - - -	37			
	1,825			
<i>Inspections</i> - - - - -	- -	558	550	550
Mr. Abercromby - - - - -	53			
" Baker - - - - -	25			
" Buchan - - - - -	194			
" Ley - - - - -	218			
Royal Meteorological Society - - - - -	25			
Mr. Scott - - - - -	65			
Scottish Meteorological Society - - - - -	100			
Captain Toynbee - - - - -	52			
Mr. Whipple - - - - -	31			
	763			
Deduct special payments not likely to recur - - - - -	205			
	558			
<i>Ocean Meteorology :</i>				
(1.) Salaries :—Discussion and reduction of observations :—	- -	1,618	1,590	1,590
Marine Superintendent - - - - -	350			
1 Senior Clerk (in charge of instruments) - - - - -	333			
1 " " (" Marine Rooms) - - - - -	275			
5 Junior Clerks - - - - -	745			
2 Unclassified Clerks - - - - -	85			
	1,788			
Add for present salaries, including increments authorised - - - - -	30			
	1,818			
Deduct proportion chargeable to care and issue of instruments (say) - - - - -	200			
	1,618			
(2.) Salaries :—Proportion chargeable to care and issue of instruments - - - - -	- -	200	200	200
(3.) Supply of instruments to the Royal Navy - - - - -	- -	(a) 460	400	330
Instruments, repairs, &c. - - - - -	494			
Verifications - - - - -	32			
	526			
(4.) Supply of instruments, &c. to Mercantile Marine - - - - -	- -	(a) 375	350	320
Instruments, repairs, &c. - - - - -	128			
Verifications - - - - -	20			
Agents' fees, &c. - - - - -	179			
Packing cases - - - - -	19			
Presentation labels - - - - -	4			
Sundries - - - - -	11			
[Receipts during the same period under heads (3) and (4), 72 <i>l.</i>] - - - - -	361			
(a) The estimated expenditure under sub-heads (3) and (4) is taken as the approximate mean of two years ending 31st March 1890.				
(5.) Distant island or coast stations - - - - -	7	20	20	20
There are no regular payments under this head.				
Totals - - - - - £	- -	15,498	15,300	15,300

SYNOPSIS of OFFICE SALARIES AND PENSIONS.

Service.	1891-92.	1890-91.	1891-92.	
			Increase.	Decrease.
	£	£	£	£
Administration - - - - -	1,590	1,580	10	—
Special Researches - - - - -	702	641	61	—
Land Meteorology - - - - -	1,214	1,264	—	50
Weather Information - - - - -	1,825	1,799	26	—
Ocean Meteorology - - - - -	1,818	1,803	15	—
Pensions - - - - -	187	187	—	—
Totals - - - - -	£ 7,336	7,274	112	50

METEOROLOGICAL OFFICE. ESTIMATES for the Year 1891-92.

Heads of Service.	Proposed for 1891-92.		Voted for 1890-91.		1891-92.	
					Increase.	Decrease.
	£	£	£	£	£	£
<i>Administration :</i>						
Payment of Council - - - - -	1,000	-	1,000			
Secretary - - - - -	800	-	800			
Salaries and wages - - - - -	780	-	780			
Rent, fuel, and lighting - - - - -	720	-	720			
Incidental and contingent expenses - - - - -	420	-	420			
Pensions - - - - -	190	-	190			
		3,910		3,910	—	—
<i>Special Researches and Experiments :</i>						
Salaries - - - - -	702					
Other charges - - - - -	298					
		1,000	-	1,000	—	—
<i>Land Meteorology :</i>						
Observatories and stations - - - - -	2,250	-	2,250			
Salaries :—Discussion and reduction of observations - - - - -	1,200	-	1,250			
		3,450		3,500	—	50
<i>Weather Information and Forecasts :</i>						
Telegraphic reports and storm warnings - - - - -	2,030	-	2,080			
Salaries :—Preparation and issue of reports and forecasts - - - - -	1,800	-	1,800			
		3,830		3,880	—	50
<i>Inspections :</i>						
Salaries and travelling expenses - - - - -	-	550	-	550	—	—
<i>Ocean Meteorology :</i>						
Salaries :—Discussion and reduction of observations - - - - -	1,590	-	1,590			
Expenses incidental to the supply of instruments :						
Care and issue of instruments - - - - -	200	-	200			
Royal Navy - - - - -	400	-	330			
Mercantile Marine - - - - -	350	-	320			
Distant island (and coast) stations - - - - -	20	-	20			
		2,560		2,460	100	—
Totals - - - - -	£ -	15,300	-	15,300	100	100

[R. S.]

The estimates were approved, and the Secretary was instructed to forward a copy to the Treasury (P.C. 2021).

Read—Letter 1960, from Mr. Cullum, stating that the price asked for Westwood House, Cahirciveen (Minutes, October 29), was 1,500*l*.

Mr. Scott was instructed to ask Mr. Cullum to ascertain if there was a chance of obtaining the house on lease (P.C. 2005).

Reported—That the Admiral Superintendent of Naval Reserves had agreed to substitute Blacksod for Claggan as a station for observing sea temperatures (Minutes, October 29) (Letter 1924).

Mr. Scott reported that he had learnt (Letter 1813) that it was not intended to publish Lloyd's Seamen's Almanac this year (Minutes, p. 36).

Reported—That the cords of the bridled anemometer at Holyhead had given way on the night of 6–7 November during the very heavy gale. The cords were old ones, and had been on from the first (Letter 1939).

Read—Letter from Mr. Baillie, stating that since last meeting four logs had been received, two of them being “excellent.”

Mr. Scott was instructed to convey the best thanks of the Council to the observers.

Submitted—The following summary as a result of the primary checking of the storm warnings issued to the coasts of the British Islands since the last meeting of the Council:—

(1.) WARNINGS ISSUED.

Summary.

A + B (successful)	-	-	-	=	48
C (failures)	-	-	-	=	7

(2.) GALES EXPERIENCED, BUT FOR WHICH NO WARNINGS WERE ISSUED.

None.

(Signed) FREDC. GASTER.

Telegraphic Branch,
12th November 1890.

Submitted—The following list of publications which had been received since the last meeting:—

Copenhagen und Hamburg, Dänisches meteorologisches Institut und Deutsche Seewarte.—Tägliche synoptische Wetterkarten. v. Jahrg., June—Nov. 1886.

Sydney Observatory.—Results of meteorological observations made in New South Wales during 1888.

—Results of rain, river, and evaporation observations made in New South Wales during 1889.

Eberswalde, Hauptstation des forstlichen Versuchswesen in Preussen.—Jahresbericht über die Beobachtungs-Ergebnisse der . . . eingerichteten forstlich-meteorologischen Stationen. 1889.

Tonga.—Statistics of the Tonga Islands for the year ended 31st December 1889.

Manila, Observatorio Meteorológico.—Observaciones verificada durante el mes de Enero de 1890.

Zürich, Schweiz. Department des Innern.—Tabellarische Zusammenstellung der Haupt-Ergebnisse für das Jahr 1886.

—Graphische Darstellung der schweizerischen hydrometrischen Beobachtungen. 1889–90.

Ragona, D.—Influenza delle condizioni atmosferiche sull' influenza.

Alessandria, Specola del Seminario.—Osservazioni meteorologiche. 1889.

Lamprecht, G.—Wetter, Erdbeben und Erdenringe.

Croydon Microscopical and Natural History Club.—Report of the Meteorological Sub-Committee for 1889.

Bombay, Meteorological Office.—Brief sketch of the meteorology of the Bombay Presidency in 1889–90.

Buenos Aires, Oficina Meteorológica Argentina.—Anales. Tomo vii.

63, *Victoria Street*, November 26, 1890.

PRESENT :

LIEUT. GENERAL STRACHEY IN THE CHAIR.

PROFESSOR DARWIN.
MR. GALTON.

MR. STONE.
THE HYDROGRAPHER.

The Secretary was in attendance.

The Minutes of the last meeting (November 12) were read and confirmed.

Read—Letter 2075 from the Admiralty requesting that a daily forecast be sent to the Commander-in-Chief, Devonport.

Mr. Scott was instructed to accede to their request (P.C. 2100), and to make arrangements for forwarding the message daily to the Admiralty.

Mr. Scott submitted a proposal from Mr. Baillie to exhibit certain charts showing the recent work of the Office on screens at the Naval Exhibition.—Approved.

Submitted—A report from Mr. Strachan stating that the observations from H.M.S. “Chanticleer,” recently received from the Admiralty, were as yet undiscussed, and were of considerable value.

The death of Miss Harris on the 12th inst. was reported. Mr. Scott was instructed to submit a scheme for the work of the Marine Department as affected by this occurrence.

Read—A letter from Mr. Baillie stating that since last meeting 12 logs had been received, 9 of them being “excellent.” Mr. Scott was instructed to convey the thanks of the Council to the observers.

Reported—That Dr. Neumayer was not disposed to purchase the anemometer at Heligoland (Letter, M.O. 1997, Minutes, p. 46).

Resolved—That it be recalled (P.C. 2102).

Submitted—The following summary, as a result of the primary checking of the storm warnings issued to the coasts of the British Islands since the last meeting of the Council :—

1. WARNINGS ISSUED.

SUMMARY.

A + B (successful)	-	-	-	-	-	= 17
C (failures)	-	-	-	-	-	= 7

2. GALES EXPERIENCED, BUT FOR WHICH NO WARNINGS WERE ISSUED.

None.

(Signed) FREDC. GASTER.

Telegraphic Branch,
26th November 1890.

Submitted—The following list of publications which had been received since the last meeting :—

Azambuja, G. A. de.—Annuario da Provincia do Rio Grande do Sul. 1891.

Fines, Dr.—Des variations de l'électricité atmosphérique à Perpignan.

— Influence de l'humidité sur le Bifilaire magnétique et moyen de la corriger.

Jamaica.—Meteorological results for the 10 years from June 1880 to May 1890, inclusive.

— Jamaica rainfall for the years 1887–89.

Paris.—Comptes rendus des séances de la première Conférence générale des Poids et Mesures, réunie à Paris en 1889.

Wellington, Meteorological Office.—Statistics of New Zealand. Meteorology. 1887–89.

Knipping, E.—Veränderlichkeit der Tagestemperatur in Japan.

— Der Wolkenbruch auf der Kii-Halbinsel, Japan, am 19 August 1889.

Zürich, Schweizerische Meteorologische Central Anstalt.—Annalen. 1888.

Helsingfors, Finska Vetenskaps-Societeten.—Öfversigt af Finska Vetenskaps-Societetens Förhandlingar. xxxi. 1888–89

Oxford, Radcliffe Observatory.—Results of meteorological observations. 1886.

Submitted—The following report on the 8.30 p.m. forecasts for October 1890 :—

The letters used have the following signification :—

a=complete success.

b=partial (i.e., more than half) success.

c=partial failure.

d=total failure.

DISTRICTS.		Percentages.			Percentage of Success. a + b.
		Wind.	Weather.	Average Forecast.	
SCOTLAND, N.	a	45	42	44	81
"	b	29	45	37	
"	c	13	7	10	
"	d	13	6	9	
SCOTLAND, E.	a	55	55	55	81
"	b	19	32	26	
"	c	16	7	11	
"	d	10	6	8	
ENGLAND, N.E.	a	61	49	55	79
"	b	16	32	24	
"	c	20	13	17	
"	d	3	6	4	
ENGLAND, E.	a	68	61	65	86
"	b	26	16	21	
"	c	6	13	9	
"	d	0	10	5	
MIDLAND COUNTIES	a	58	55	57	80
"	b	26	20	23	
"	c	16	19	17	
"	d	0	6	3	
ENGLAND, S.	a	71	65	68	84
"	b	19	13	16	
"	c	10	19	15	
"	d	0	3	1	
SCOTLAND, W.	a	45	32	39	68
"	b	23	35	29	
"	c	22	23	22	
"	d	10	10	10	
ENGLAND, N.W.	a	49	42	46	79
"	b	35	32	33	
"	c	10	16	13	
"	d	6	10	8	
ENGLAND, S.W.	a	55	42	49	88
"	b	36	42	39	
"	c	6	13	9	
"	d	3	3	3	
IRELAND, N.	a	32	55	44	79
"	b	32	39	35	
"	c	23	3	13	
"	d	13	3	8	
IRELAND, S.	a	32	45	39	76
"	b	36	39	37	
"	c	29	10	20	
"	d	3	6	4	
SUMMARY.					
BRITISH ISLES	a	52	50	51	80
"	b	27	31	29	
"	c	16	13	15	
"	d	5	6	5	

63, *Victoria Street*, December 10, 1890.

PRESENT :

LIEUT.-GENERAL STRACHEY IN THE CHAIR.

MR. BUCHAN.

PROFESSOR DARWIN.

MR. GALTON.

MR. STONE.

THE HYDROGRAPHER.

The Secretary was in attendance.

The Minutes of the last meeting (November 26) were read and confirmed.

Read—The following letter (Minutes, p. 1):—

The Royal Society, Burlington House.
(December 3, 1890.)

SIR,

IN a letter from the India Office (R. and L. 1805) dated November 19th, and addressed to the Secretary of the Royal Society, Mr. Godley, by direction of the Secretary of State for India, transmits a copy of a letter from the Government of India relative to the proposed publication of the magnetic and meteorological observations taken in Trevandrum by the late Mr. J. Allan Broun, from which it appears that that Government are willing that the meteorological observations should be published under the superintendence of Mr. Eliot, but that they are unable to arrange for the publication of the magnetic observations, and they suggest that these, being of more general interest, might be published in this country.

The letter concludes with a request that the manuscript meteorological observations in question may be sent to the India Office for transmission to the Government of India. As the manuscript is, I believe, in your custody, I venture to request that you will have the goodness to forward it to the India Office as requested.

I am, &c.

(Signed) M. FOSTER,
Secretary R.S.

R. H. Scott, Esq., F.R.S., &c.,

Secretary to the Meteorological Council.

The Chairman stated that he had, in April, written to the Secretary to the Royal Society, in answer to the letter printed on the Minutes (page 1).

Submitted—The following summary, as a result of the primary checking of the storm warnings issued to the coasts of the British Islands since the last meeting of the Council:—

1. WARNINGS ISSUED.

A + B (successful)	-	-	-	= 14
C (failures)	-	-	-	= 14*

2. GALES EXPERIENCED, BUT FOR WHICH NO WARNING WAS ISSUED.

None.

Telegraphic Branch,
December 10, 1890.

Read—A letter from Mr. Baillie reporting that since last meeting six logs had been received, three of them being "excellent." Mr. Scott was instructed to convey the marked thanks of the Council to the observers.

Mr. Scott reported, with reference to the vacancy caused in the staff by Miss Harris's death, that he had consulted with Mr. Baillie, and recommended that another lady be employed, duly qualified as to calculations and drawing, at a salary of 12s. 6d. per week, rising to 1l., according to proficiency, as in previous cases. (Minutes, 1884, p. 109.)

Reported—That the following instruments had been ordered for stock, to meet demands from stations:—

		£	s.	d.
Six minimum thermometers for shade, cost	-	-	6	0
" " " " exposure, cost	-	-	5	11
Six fishery barometers, cost	-	-	24	6

December 6, 1890.

* Four of these resulted from a very faulty telegram received on the evening of the 7th from Lisbon. But for this telegram the warnings would not have been issued.

Submitted—The following report on the 8.30 p.m. forecasts for November 1890 :—

The letters used have the following signification :—

a=complete success.

b=partial (i.e., more than half) success.

c=partial failure.

d=total failure.

NOVEMBER.

DISTRICTS.		Per-centages.			Per-centage of Success. a + b.
		Wind.	Weather.	Average Forecast.	
SCOTLAND, N.	a	31	59	45	81
"	b	41	31	36	
"	c	21	7	14	
"	d	7	3	5	
SCOTLAND, E.	a	48	52	50	71
"	b	17	24	21	
"	c	31	17	24	
"	d	4	7	5	
ENGLAND, N.E.	a	48	59	54	71
"	b	17	17	17	
"	c	28	14	21	
"	d	7	10	8	
ENGLAND, E.	a	30	53	42	72
"	b	33	27	30	
"	c	27	7	17	
"	d	10	13	11	
MIDLAND COUNTIES	a	16	53	35	63
"	b	30	27	28	
"	c	47	7	27	
"	d	7	13	10	
ENGLAND, S.	a	38	48	43	74
"	b	34	38	31	
"	c	31	7	19	
"	d	7	7	7	
SCOTLAND, W.	a	40	43	42	75
"	b	33	33	33	
"	c	24	17	20	
"	d	3	7	5	
ENGLAND, N.W.	a	38	48	43	83
"	b	38	42	40	
"	c	14	7	11	
"	d	10	3	6	
ENGLAND, S.W.	a	45	72	59	85
"	b	24	28	26	
"	c	24	0	12	
"	d	7	0	3	
IRELAND, N.	a	30	50	40	82
"	b	37	47	42	
"	c	23	3	13	
"	d	10	0	5	
IRELAND, S.	a	23	50	37	85
"	b	50	47	48	
"	c	20	3	12	
"	d	7	0	3	
SUMMARY.					
BRITISH ISLES	a	35	53	44	76
"	b	31	33	32	
"	c	27	8	18	
"	d	7	6	6	

Submitted—The following statements of work during the month of November :—

MARINE BRANCH.

December 9, 1890.

Examined 15 new logs.

The members of the staff chiefly employed in advancing (1) the arrangement of the data for the discussion of the meteorology of the district between the Cape of Good Hope and New Zealand; and (2) charting the currents in all oceans contained in the Remark Books of H.M. ships, lent by the Hydrographic Department of the Admiralty, the number of such books received during the month being 401.

A sheet of 12 small charts of the district round Cape Guardafui has been prepared showing generalised results of the details represented in the large monthly charts. All observations of currents received up to date have now been added to the work.

Advancing the Red Sea charts towards completion.

(Signed) CHAS. HARDING.

The Marine Superintendent.

Forwarded for the information of the Council.

(Signed) C. W. BAILLIE.

TELEGRAPHIC (FORECAST AND STORM WARNING) BRANCH.
(To November 30, 1890.)

Monthly Weather Report, 1887.—*May*, revised and sent for press; *June*, in course of revision. Other months as before.

Monthly Weather Summary, 1890.—Materials for *October* prepared. *May*, gone forward "for press." *June*, all but ready for printer.

Weekly Weather Report, 1890.—All numbers issued promptly. *Appendix I.*, Part 3, issued. All the other Appendices well up to date.

Daily Weather Report, 1890.—All numbers issued promptly. *Correction and addition sheet for October* issued.

Primary Checking of Storm Warnings, 1889.—Completed up to date.

Checking of Daily Forecasts.—Done to date.

Checking of Hay Harvest Forecasts, 1890.—In hand and proceeding slowly.

Preparation of New Averages of Pressure, Temperature, Rainfall, and Bright Sunshine, for use in the *Daily* and *Weekly Weather Reports* for 1891.—Well in hand. These new averages include the values for the lustrum 1886–90, now nearly completed.

During this month I have spent four more days in law courts; sickness has kept clerks away from office equal to about one man's time for a week, and the vacation time has been almost completed.

(Signed) FREDC. GASTER.

PANTAGRAPH ROOM.

December 1, 1890.

Hourly Means.—The revision of the proofs of this work for 1887 has been carried on, but a good deal of time has been spent upon further suggested alterations in the form of the publication.

Harmonic Analysis of Hourly Readings.—The Greenwich section of this work has been passed through the press, and the remainder of the calculations required to complete the tables for the seven observatories of the Office have been made. A good deal of time has been spent upon the arrangement of the tables, and in deciding upon the form in which they are to be printed. All the "copy" is now with the printer.

The Kew means for 1890 have been kept as close up to date as possible in view of their being required for the Kew Report. The Bunhill Row sunshine cards have been tabulated as usual for the Royal Meteorological Society.

(Signed) R. H. CURTIS.

R. H. Scott, Esq., F.R.S.

EXAMINATION BRANCH.

December 1, 1890.

Examinations.

October 1890.—Work for all observatories completed.

Weekly examination (on receipt) of the curves and documents from all observatories.

Reports, &c.

October 1890.—Copies of the "Notes of Errors" to all observatories.

General.

The Diurnal Range of Rainfall, 1881–90 :—The extractions and computations have been proceeded with.

Preparation of the "Diary of Operations, 1891," revising working forms 1, 2, and 3, and correcting proof of same.

Various routine matters have also occupied much of Messrs. Parsons and Hewitt's time.

(Signed) T. E. ALLEN.

Reported—That the cash accounts for the six months ended the 30th September 1890 had been audited by the Chairman and Professor Darwin, and would forthwith be sent to the Treasury for the Audit Office. The receipts for the six months amounted to 7,972*l.* 18*s.* 3*d.* The payments amounted to 7,761*l.* 5*s.* 8*d.*, leaving a balance of 3,627*l.* 19*s.* 3*d.* in hand and at the bank on 1st October 1890, as against 3,416*l.* 6*s.* 8*d.* on the 1st April.

ABSTRACT of CASH ACCOUNTS for Five Years ending 31st March, 1890.

Heads of Service.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.
	£	£	£	£	£
Council - - - - -	1,000	1,000	1,000	1,000	956
Secretary - - - - -	800	800	800	800	800
Salaries and wages - - - - -	770	793	807	798	801
Rent, fuel, and lighting - - - - -	719	710	716	716	715
Incidental and contingent expenses - - - - -	474	661	472	460	510
Pensions - - - - -	43	43	43	139	187
Special researches - - - - -	766	493	773	587	678
Land Meteorology - - - - -	1,817	1,871	1,875	1,975	1,954
Discussions (salaries) - - - - -	1,318	1,291	1,300	1,329	1,482
Weather information and forecasts - - - - -	3,003	3,083	2,720	2,745	2,548
Preparation and issue of reports, &c. (salaries)	1,584	1,640	1,660	1,682	1,788
Inspections - - - - -	549	560	525	602	764
Ocean Meteorology (salaries) - - - - -	2,024	2,059	2,084	1,877	1,788
Supply of instruments: Royal Navy - - - - -	376	430	278	393	526
Mercantile Marine - - - - -	409	437	258	391	362
Distant island or coast stations - - - - -	20	22	80	31	7
Yearly total of payments - [Net]	15,672	15,893	15,391	15,525	15,866
Total cash balance at end of March in each year - - - - -	2,265	2,382	2,961	3,469	3,416

The payments on account of "Commissions" are not included.

(Signed) J. S. HARDING, Junr.

Resolved—That the usual bonus of 3*l.* 3*s.* 0*d.* be given to those of the telegraphic reporters who have discharged their duties satisfactorily during the year. (Minutes, 1889, p. 67.)

Submitted—The following reports of inspections of the self-recording observatories and anemograph stations by Messieurs Whipple and Baker :—

(M.O. 2119.)

Stonyhurst Observatory was inspected on August 14th, 1890.

The instruments were found in good order, the barograph lense was cleaned, although found to be much discoloured with fungoid growth between them, and the clocks were oiled. The thermograph calls for no note beyond the fact that the wet-bulb threads required to be replaced by new ones, which was done.

The anemograph was in want of cleaning and oiling; it was accordingly wiped and oil applied. The joints in the long shafts have very considerable play, but that could not be rectified without fitting new screws. The rain-gauge was in very good order, but the pencil in use seemed to be coarser than is usually employed.

The sunshine recorder was in good order.

At the time of the inspection the two senior assistants were absent on account of illness, and the routine work was being carried on by a lad under the superintendence of the Rev. W. Sidgreaves.

Comparisons of thermometers were made as follows, Kew Standard of reference, K.S. No. 682 being used :—

Corrections to Dry, K.S. 619 -	-	-	-	-	0°
" Wet, K.S. 382 -	-	-	-	-	-0° 2
" Bar. Ther., K.S. 339 -	-	-	-	-	-0° 5
" Max., M.O. 439 -	-	-	-	-	-0° 5
" Min., B.T. 501 -	-	-	-	-	-0° 3
					+0° 3

Aberdeen Observatory, visited August 2nd, 1890.—All the instruments were found duly working in good order. Lenses, &c. were cleaned and clocks oiled. No repairs were required. Owing to inclement weather the anemograph could not be entirely dismantled, but the bearings were all examined, and being found in good order were freshly oiled throughout. The sunshine recorder

examination is registered on the printed form. The comparison of the thermometers was made in pounded ice, the results being entered in appended table:—

Dry, K.S. 397	-	-	-	-	-	-	-	0.05
Wet, K.S. 395	-	-	-	-	-	-	-	0.6
Max., M.O. 1,002	-	-	-	-	-	-	-	0.0
Min., 5,056	-	-	-	-	-	-	-	0.1
Bar. Std., K.O. 71,061	-	-	-	-	-	-	-	0.4

Glasgow Observatory, visited August 18th, 1890.—The barograph, thermograph, and rain-gauge were all found to be working in good order. The lenses were cleaned and clocks oiled. The thermometers were compared with the inspector's standard, with the result given in the appended table. The anemograph was cleaned and examined, all the bearings being found in good order and the shafts sound. A blade of one direction fan being loose, it was carefully soldered up and set right. The sunshine recorder was also examined. The corrections to the thermometers were found to be as follows:—

Dry Std., K.S. 550	-	-	-	-	-	-	-	0.1
Wet Std., K.S. 472	-	-	-	-	-	-	-	0.3
Max., 58,846	-	-	-	-	-	-	-	+0.1
Min., 63,942	-	-	-	-	-	-	-	0.1
Bar. Ther.	-	-	-	-	-	-	-	0.7

Swanbister, Orkney, visited August 25th, 1890.—Mr. Fortescue having removed from this station to a house in Kirkwall, the care of the anemograph, together with the sunshine recorder, had been delegated to a young woman residing about a mile distant, and both instruments were found to have been maintained in thorough order. A new site for the instruments having been selected by Mr. Fortescue and approved by Mr. Buchan, on the hill above Stennis schools, where Mr. Spence, the schoolmaster, had undertaken the duties of observer; the anemograph, its hut and the sunshine recorder with its support, were dismantled and packed upon carts for removal. The next morning these were driven over the hills to the new site, where they were met by the inspector on arrival, with Mr. Fortescue, who kindly gave his assistance in the operation of re-erection. Mr. Spence was on the spot with the necessary workmen, and after marking the ground out with due regard to the proper orientation, foundations were dug and the necessary masonry built up to support the hut. This being done and the external parts of the anemograph being thoroughly cleaned, it was set up, approximately adjusted, and the instrument started by nightfall. The inspector and mechanic drove back to Kirkwall and returned next day, when the recording apparatus was taken to pieces and all, including the clock, thoroughly overhauled, cleaned, and oiled. Compass bearings were then taken of distant objects and the instrument properly adjusted, the observer instructed as to the working and care of it, and the anemograph fairly started in action.

The weather was very inclement and stormy, with heavy rain showers both days, with cloud, so rendering it impossible to adjust the sunshine recorder properly. This operation had therefore to be left in the hands of Mr. Spence, who was instructed how to perform it as soon as opportunity served. The exposure of the site is perfectly free and open on all sides, with the exception of slightly rising ground to the south, which, however, is insufficient to obstruct the solar rays at any time or materially to influence the wind's force when blowing from that quarter.

BEARINGS of LANDMARKS from STENNIS ANEMOMETER.

N. corrected.—Western extremity of the headland of Ness and Harray and near farm of Brodgar.

E. and S.—Nil.

W. point.—Garden on farm of Marcequoi cairsto.

Fleetwood.—The anemograph at this station was inspected on August 11th–13th. The instrument was found working properly and well kept. Both shafts were taken out, and when cleaned of corrosion, small cracks were found in both shafts, which I had soldered up by a smith before replacing them. The direction fans were found free in their action, but their pitch is apparently coarser than in the case of other instruments, hence the diminished oscillation usually recorded. The loose blades on the fans were soldered up, and the nut on the clamping screw of the clock, which was found loose, was made tight. The orientation was examined and re-adjusted by a compass. At the request of Mr. Gaultier, I looked out a suitable spot for placing the sunshine recorder, should the town commissioners decide upon purchasing such an instrument. From the south side of the pavilion a perfectly clear horizon could be obtained for about 300° from NNE. to NNW.

North Shields.—Visited the high lighthouse to inspect the anemograph September 5th–6th. Found it working in good order; cleaned the whole thoroughly, and examined the shafts. These were not split, but the Hook's joints appear somewhat slack. Oriented vane anew from sun's observation.

Farmouth, September 11th–12th.—The anemograph at the Sailor's Home was thoroughly examined and cleaned, the shafts being also tested and found sound. A joint in the velocity shaft had worked loose and was screwed up tight. The clock was taken down, cleaned, and freshly oiled. The Hook's joints are all loose from wear. The orientation was tested by sun, and instruc-

tions given to Mr. Watson to set for N. about half compass point further to the east than he had been in the habit of doing, when checking the direction in future.

(Signed) G. M. WHIPPLE.

(M.O. 2120.)

Radcliffe Observatory, Oxford, October 1st.—The whole of the instruments here were in a satisfactory condition and call for no special remark. The sunshine recorder is very well placed on the tower of the observatory about 100 feet above the ground, and has an uninterrupted exposure all the year through. Further details are given on the special form which accompanies this report.

A comparison of the various thermometers in use with the Kew standard thermometer No. 682 was made by me with the following results at 62° :—

Correction to standard dry bulb, No. 576	-	-	-	-	0.1
" " " wet " No. 575	-	-	-	-	0.2
" " maximum, M.O. 356	-	-	-	-	0.5
" " minimum, M.O. 363	-	-	-	-	0.1
" " barograph thermometer	-	-	-	-	0.2

The instruments placed in the Stevenson's screen were also examined as follows at 62° :—

Correction to dry bulb, B.T. 1,710	-	-	-	-	0.3
" " wet " " 1,709	-	-	-	-	0.3

Holyhead, visited October 2nd–3rd.—At this station the anemograph was found in excellent working order, and as usual is well attended to. Unfortunately at the time of my visit the wind was blowing more than half a gale, so that it was impracticable to dismount the exterior portions of the instrument.

The bearings, however, were examined and the orientation duly tested.

My attention was called to the unsatisfactory state of the clips which fasten the paper to the cylinder; these were put right before leaving.

Mountjoy Barracks, October 4th.—Here the anemograph was in want of cleaning, the oil in the direction bearing having become thick and hard. The instrument was accordingly dismounted, the external parts cleaned and fresh oil added. After re-mounting, the orientation was examined and the sheet is forwarded herewith.

The clock was taken to pieces and cleaned.

Armagh, visited October 7th–8th.—On dismounting the anemometer at this observatory it was found that the oil in the direction bearing had become dry and hard. After cleaning all parts of the instrument the bearings were lubricated with mineral oil.

Dr. Dreyer called my attention to the pricker, which worked very stiffly; this was cleaned and set right.

The orientation was examined and found satisfactory.

As regards the rain-gauge the clock was taken to pieces, cleaned, and a new line attached to the weight.

Valencia Observatory, visited October 11th–15th.—The instruments here were all found to be in excellent order, and the anemometer well oiled and cared for.

The barograph and thermograph clocks were duly cleaned, and the lenses, condensers, and mirrors carefully wiped.

The various thermometers were compared with Kew standard thermometer No. 682, and found to require the following corrections, namely :—

Standard, dry bulb, No. 399	-	-	-	-	0.7
" wet " " 398	-	-	-	-	0.5
Maximum, M.O. 1,003	-	-	-	-	0.1
Minimum, M.O. 2,497	-	-	-	-	0.1
Barograph thermometer	-	-	-	-	2.0
Standard barometer, attached thermometer No. K.O. 71,062	-	-	-	-	0.1

The external parts of the anemometer were taken down and cleaned, after which all the bearings were lubricated by means of mineral oil. After cleaning the clock the orientation was tested as usual, and the paper is herewith sent.

The rain-gauge clock was cleaned and the Stonyhurst discharger, which had been removed by Mr. Cullum (previous to my visit), was examined and re-adjusted, and after repeated trials was again fitted to the gauge.

Falmouth Observatory, visited October 20th–24th.—Everything was found to be working satisfactorily.

The usual cleaning of the barograph and thermograph clocks was duly performed, and the lenses and other parts attended to. A new line was attached to the barograph clock. On looking over the photographic traces, I noticed in the case of the thermograph sheet that it was slightly discoloured by stray light; this was rectified before leaving, and the zero lines shifted from the summer to the winter position.

The thermometers were compared with Kew standard 682, and found to have the following corrections at 62°, namely :—

Dry Standard, No. 383	-	-	-	-	-	-	-0·6
Wet Standard, No. 388	-	-	-	-	-	-	-0·3
Maximum, M.O. 104	-	-	-	-	-	-	-0·5
Minimum, M.O. 308	-	-	-	-	-	-	0·0
Barograph thermometer (no number)	-	-	-	-	-	-	-0·8
Standard barometer, attached thermometer (no number)	-	-	-	-	-	-	-0·8

As regards the sunshine recorder, this instrument is placed on an iron support, which is fixed to the south railing on the roof of the observatory, the exposure being good all the year round. The adjustment for latitude was not quite right, the trace being a little too low on the card, but this was corrected by means of a wooden wedge.

The anemometer was completely dismantled and all parts cleaned, the bearings afterwards being lubricated with mineral oil.

Two blades of one of the direction vanes were found loose, but these I caused to be soldered tight before again erecting the instrument.

The clock was cleaned and the orientation tested, the sheet being sent in with the inspection notes.

The rain-gauge was examined, and the clock cleaned.

(Signed T. W. BAKER.

Submitted—The following list of publications which had been received since the last meeting :—

Stanley, W. F.—Surveying and levelling instruments.

Bombay, Government Observatory.—Report on the condition and proceedings of the Government Observatory, Colaba, for the year which ended with the 30th June 1890.

Washington, Signal Office.—Annual report for the year 1890. (Advance copy.)

Sundell, A. F.—Åskvåden i Finland 1889.

Calcutta, Meteorological Office.—Administration report of the Meteorological Reporter to the Government of Bengal for the years 1887–90.

Magdeburg.—Jahrbuch der meteorologischen Beobachtungen der Wetterwarte der Magdeburgischen Zeitung. 1889.

Baxendell, J.—Abstract of meteorological results for the Borough of Southport. 1872–89.

Croydon Microscopical and Natural History Club.—Proceedings and Transactions. 1888–89.

Pini, E.—Andamento annuale e diurno della pioggia nel clima di Milano.

Ceylon, Surveyor General.—Report on the meteorology of Ceylon for 1889.

Kammermann, A.—Résumé météorologique de l'année 1889 pour Genève et le Grand Saint-Bernard.

Rijckevorsel, Dr. van.—An attempt to compare the instruments for absolute magnetic measurements at different Observatories.

63, Victoria Street, January 7, 1891.

PRESENT:

LIEUT.-GENERAL STRACHEY IN THE CHAIR.

MR. BUCHAN.
PROFESSOR DARWIN.

MR. GALTON.
MR. STONE.

THE HYDROGRAPHER.

The Secretary was in attendance.

The Minutes of the last meeting (December 10) were read and confirmed.

Mr. Scott submitted the following memorandum on the contents of the Trevandrum MSS. books now in the Office (Minutes, 1888, pp. 47 and 64; 1890, pp. 1 and 64):—

SIR, January 7, 1891.
THE following report has been prepared as directed by General Strachey, on the 3rd instant:—

1. The observations made at Trevandrum Observatory are contained in 25 volumes, which have now been marked No. 1 to 25:—

- | | |
|--------|-------------------------------------|
| No. 1. | 1853, January 1 to July 5. |
| " 2. | " July 7 to 1854, January 10. |
| " 3. | 1854, January 11 to March 6. |
| " 4. | " March 6 to May 15. |
| " 5. | " May 16 to July 29. |
| " 6. | " July 31 to October 19. |
| " 7. | " October 20 to December 31. |
| " 8. | 1855, January 1 to November 20. |
| " 9. | " November 20 to 1856, October 6. |
| " 10. | 1856, October 6 to 1857, August 22. |
| " 11. | 1857, August 23 to 1858, July 9. |
| " 12. | 1858, July 9 to November 18. |
| " 13. | " November 19 to 1859, March 31. |
| " 14. | 1859, March 31 to August 13. |
| " 15. | " August 14 to 1860, January 24. |
| " 16. | 1860, January 25 to June 30. |
| " 17. | " July 1 to December 15. |
| " 18. | " December 16 to 1861, June 26. |
| " 19. | 1861, June 26 to 1862, March 1. |
| " 20. | 1862, March 2 to August 24. |
| " 21. | " August 24 to 1863, February 21. |
| " 22. | 1863, February 22 to August 23. |
| " 23. | " August 24 to 1864, March 16. |
| " 24. | 1864, March 16 to September 9. |
| " 25. | " September 9 to 1865, March 3. |

The magnetical observations are recorded on the left-hand page, the meteorological on the right.

The magnetical observations consist principally of hourly declinations from various instruments, and have all been discussed by J. A. Broun, F.R.S., in "Trevandrum Magnetical Observations, volume I.," published by Henry S. King & Co., 1874. Volume II. has not been published. The only magnetical observations not published are, apparently:—

Horizontal Force (148 days.)	{	1853 . 1 . 2 to 1853 . 1 . 5.
		1853 . 7 . 10 to 1853 . 8 . 3.
		1853 . 9 . 11 to 1854 . 1 . 10.
Vertical Force (about 450 days.)	{	1853 . 1 . 19 to 1853 . 1 . 28.
		1853 . 10 . 21 to 1853 . 10 . 29.
		1853 . 10 . 31 to 1853 . 12 . 30.
		1854 . 1 . 8 to 1854 . 1 . 10.
		1854 . 3 . 16 to 1854 . 12 . 3.

I have not found any other magnetical observations which have not been discussed in the volume cited.

The meteorological observations at Trevandrum commence 1853, January 1st and end 1865, March 4th, embracing 12 years, 2 months, and 4 days. The hourly observations comprise barometer, dry and wet thermometers, wind direction and force, cloud amount and motion, evaporation, vapour tension, weather, earth thermometers, &c.

2. The observations made at Agustia, 6,000 feet above the sea, are contained in six volumes, which have now been marked Nos. 26 to 31 :—

No. 26.	1855 . 7 . 1 to 1856 . 5 . 17.
„ 27.	1856 . 5 . 18 to 1857 . 3 . 21.
„ 28.	1857 . 3 . 22 to 1858 . 2 . 9.
„ 29.	1858 . 2 . 9 to 1858 . 10 . 1.
„ 30.	1864 . 5 . 19 to 1864 . 11 . 8.
„ 31.	1864 . 11 . 9 to 1865 . 2 . 28.

The magnetical observations relating to Declination made at Agustia with various instruments have apparently been discussed in volume I. of "Trevandrum Magnetical Observations." The only exceptions which I have noticed are Intensity, 1864, May 19th to 1865, January 11th, and Induction, 1864, May 19th to 1864, July 21st.

The meteorological observations at Agustia commence 1855, July 1st and end 1858, December 31st, recommence 1864, May 19th and close 1865, February 28th, embracing together four years, three months, and nine days. They are in all respects similar to those for Trevandrum.

Your, &c.

(Signed) R. STRACHAN,

To R. H. Scott, F.R.S.

Mr. Scott reported that Mrs. Broun apparently had not in 1880 deposited at the Office the unbound MSS. memoranda mentioned under the heads 3 and 4 in Mr. Strachan's previous list (Minutes, 1880, p. 47), and he was instructed to inform Mrs. Broun that as the Indian Government had undertaken to have the meteorological records published, the Council would be glad to forward to Calcutta any additional memoranda she might wish to send. (P.C. 55.)

Mr. Scott was further instructed to forward to the India Office the volumes enumerated in the above memorandum. (P.C. .)

Reported—That Mr. Cullum had stated (Letter 2192) that the executors of Miss Needham had informed him that they could not entertain a proposal that the Office should rent Westwood House (Minutes, p. 60), as the legatees were determined to sell the property. Mr. Cullum further stated (Letter 2283) that the price was 1,400l.

Mr. Scott submitted a copy of the lease from Trinity College to Captain Needham for 99 years, from March 25, 1866, which he had procured from the Board of Trinity College by the Chairman's directions.

The Chairman stated that by his instructions the subjoined letter had been written to the Treasury :—

(M.O. 2283.)

SIR,

January 5, 1891.

THE Meteorological Council are desirous of obtaining a lease of a house at Valencia on the west coast of Ireland, to be occupied as an observatory in lieu of that which they now have. Their constitution however, and their dependence on the annual Parliamentary grant, makes it difficult, if not impossible, to treat with a landlord as an ordinary independent tenant might do.

The Council are satisfied that an observatory, such as they now have at Valencia, will always be required there, so long as the meteorological services discharged under the supervision of the Council are maintained, and there seems no reason for supposing that they will be dispensed with, even though the system of management were modified. The Council therefore cannot doubt that it will be for the public interest that they should obtain for this purpose a building which can be regarded as permanently devoted to it, from which they are not likely to be compelled to move, or in respect of which their position should not be liable to be embarrassed by discussions as to rent and so forth.

The house which has become available, and the lease of which they desire to obtain, is far more convenient in every way than the present building, and better suited for the purpose of the observatory. The lease is held from Trinity College, Dublin, a body which it may reasonably be anticipated would be well disposed to facilitate the scientific objects which the Meteorological Office is maintained to promote.

The Council have at their command a surplus cash balance which would enable them to purchase the residue of the lease of the house in question which will extend over a term of about 74 years, with a small ground rent, believed to be 10l. yearly, which will constitute a very light charge on the meteorological grant, and of course the rent now paid for the building at present occupied will be saved during the currency of the lease. The purchase money would be 1,400l.

The Meteorological Council therefore would suggest as a way of avoiding the difficulties attending their technical position, that the lease might be purchased in the name of the Royal Society, a corporate body capable of entering into the needful legal contracts, the purchase money being supplied by the Meteorological Council from the funds now available. No doubt the assent of the Royal Society will be necessary, but there is no reasonable doubt that they will concur if the arrangement

meets the approval of the Lords Commissioners of the Treasury, whose consent the Council have felt to be quite essential to obtain before proceeding further in the matter.

There would be no difficulty in giving the Royal Society such a control over the lease as to secure them against all financial risk in respect to the transaction, and that body would virtually act as trustees on behalf of the Treasury, and in the event of circumstances arising under which it might be desirable to sell the lease, the proceeds of the sale might be held for the Treasury to be applied as my Lords might direct.

As it is now essential for the successful negotiation of the purchase of the lease that action should be taken within a very few days, the Council will esteem it a favour if this matter is submitted to my Lords for the earliest possible consideration.

I am, &c.
(Signed) ROBERT H. SCOTT.

The Secretary of the Treasury.

Mr. Scott was instructed to inform the executors of Miss Needham that the Council contemplated arrangements for the purchase of the lease for 1,400*l*.

Read—Letter 2235 from the Colonial Office, asking the opinion of the Council as to the desirability of maintaining regular meteorological observations at St. Helena.

Mr. Scott was instructed to reply that the Office would be ready to supplement the instruments at present on the island, if the Colony was in a position to purchase such as may be required. The Council would be ready to issue an anemometer on loan, if a suitable site and competent observer could be found. (P.C. 65.)

Read—Letter 2252 from Lieutenant Frederick, H.M.S. “Dart,” suggesting that the Rev. Dr. Gunn, of Fotuna, New Hebrides, should probably undertake observations if supplied with instruments.

Mr. Scott was instructed write to Dr. Gunn on the subject (P.C. 118.) and to forward a set of instruments through Lieutenant Frederick, to be given to Dr. Gunn, or failing him, to some other qualified and trustworthy person who would undertake to observe regularly.

Mr. Scott reported that the calculation of the mean monthly hourly values of pressure and temperature had been completed for the 10 years 1874–83 (Minutes, 1888, p. 91), and stated if the tabulations for the five previous years (1869–73) were to be similarly treated, they must be copied out, as none of these had been either printed or lithographed. It was resolved to postpone consideration of this question until the calculations for the years 1884–86 inclusive had been completed.

Read—A letter from Mr. Baillie stating that since last meeting 10 logs had been received, nine of them being “excellent.” Mr. Scott was instructed to present the charts (O. 27) to Captain Elliott and Mr. Young, and to convey the marked thanks of the Council to the other observers.

Mr. Scott drew the attention of the Council to the difficulty experienced in taking sea temperatures at Port Isaac, Cornwall, owing to the surf (Letter 1862, 1888), and he was instructed to request the local Inspecting Commander of Coastguard to substitute another north Cornish station for Port Isaac. (P.C. 70.)

Read—Letter 2230 from Mr. Lockyer, asking if the Council could make any allowance for the care of the sunshine recorder lent to him in December 1889 for his observatory at Westgate-on-Sea.—Declined. (P.C. 62.)

Submitted—The following statements of work during the month of December 1890:—

MARINE BRANCH.

January 6, 1891.

Examined 12 new logs.

Extracting from official logs data for the discussion of the meteorology of the district between the Cape of Good Hope and New Zealand.

Charting ocean currents from official logs and from the remark books of Her Majesty's ships, lent for the purpose by the Hydrographic Department. The number of remark books received during December was 606, and the total for the year 5,604.

The 12 monthly charts for the neighbourhood of Cape Guardafui having had the latest information added have been sent to the lithographer for revise. A sheet of 12 small charts representing in a generalized form the information on the large monthly charts, also sent to the lithographer.

Preparing a sheet showing the curves of instrumental means for the Red Sea district for each month of the year. Also tabulating and obtaining the frequency of winds attaining force 8 and upwards in the same area.

(Signed) CHAS. HARDING.

The Marine Superintendent.

Forwarded for the information of the Council,

(Signed) C. W. BAILLIE.

TELEGRAPHIC (FORECAST AND STORM WARNING) BRANCH.
(To 31st December 1890.)

Monthly Weather Report, 1887—June and July proofs received and sent “for press”; August in hand; other months as before.

Monthly Weather Summary, 1890.—Materials for November prepared, those for December well in hand. June and July published; August just received from printer.

Weekly Weather Report, 1890.—All numbers published promptly; all appendices well in hand.

Weekly Weather Report, 1891.—All necessary arrangements made for adding to columns on first and second pages, and for introducing the new averages of temperature, rainfall, and bright sunshine—brought up to 1890.

Daily Weather Reports, 1890.—All issued promptly, with monthly correction sheet for November.

Daily Weather Reports, 1891.—Maps and other standing part of report re-drawn, for issue from January 1, with new means of pressure, temperature, and rainfall.

Primary Checking of Storm Warnings issued.—Done to date.

Checking of Daily (8.30 p.m.) Forecasts.—Done to date.

Checking of Hay Harvest Forecasts, 1890.—In hand.

Preparation of Averages, &c., referred to in last report.—Well in hand. Those for January already in use for daily and weekly reports.

(Signed) FREDC. GASTER.

Telegraphic Branch,
January 7, 1891.

PANTAGRAPH ROOM.

January 1, 1891.

Hourly Means.

The revision of the proofs of this work for 1887 is still in progress, and is now about half completed. The calculation of the means for 1888 is in hand.

Harmonic Analysis of Hourly Readings.

Further alterations required in the tables of this work have delayed it more than was anticipated, but about two-thirds of it is now in type.

Miscellaneous.

The Bunhill Row sunshine cards have been tabulated for the Royal Meteorological Society, and the dating, &c. of the cards from all the stations has been kept up. The Kew means of pressure and temperature have been kept close up to date in view of their being required for the report of that observatory. Some time has been occupied in connexion with a slide-rule required for cloud work at the Blue-Hill Observatory.

(Signed) R. H. CURTIS.

R. H. Scott, Esq., F.R.S.

EXAMINATION BRANCH.

Examinations.

November 1890.—Work for all observatories completed.

Weekly examination (on receipt) of the curves and documents.

Reports.

November 1890.—Copies of the “Notes of Errors” to all observatories.

General.

The Diurnal Range of Rainfall, 1881–90.—Proceeded with.

Various routine matters have also occupied much of Messrs. Parsons and Hewitt’s time.

(Signed) T. E. ALLEN.

Submitted—The following summary, as a result of the primary checking of the storm warnings issued to the coasts of the British Islands since the last meeting of the Council:—

1. WARNINGS ISSUED.

SUMMARY.

A + B (successful)	-	-	= 22
C (failures)	-	-	= 15

2. GALES EXPERIENCED, BUT FOR WHICH NO WARNINGS WERE ISSUED.

None.

(Signed) FREDC. GASTER.

Telegraphic Branch,
January 7, 1891.

Submitted—The following reports on the 8.30 p.m. forecasts for December 1890 :—

The letters used have the following signification :—

a=complete success.

b=partial (i.e. more than half) success.

c=partial failure.

d=total failure.

DECEMBER.

DISTRICTS.		Per-centages.			Per-centage of Success. a + b.
		Wind.	Weather.	Average Forecast.	
SCOTLAND, N.	a	24	47	36	84
"	b	60	37	48	
"	c	13	10	12	
"	d	3	6	4	
SCOTLAND, E.	a	37	50	44	79
"	b	43	27	35	
"	c	17	7	12	
"	d	3	16	9	
ENGLAND, N.E.	a	54	60	57	82
"	b	33	17	25	
"	c	10	13	12	
"	d	3	10	6	
ENGLAND, E.	a	50	50	50	91
"	b	37	44	41	
"	c	10	3	6	
"	d	3	3	3	
MIDLAND COUNTIES	a	57	57	57	89
"	b	30	33	32	
"	c	13	3	8	
"	d	0	7	3	
ENGLAND, S.	a	70	67	69	94
"	b	24	27	25	
"	c	3	3	3	
"	d	3	3	3	
SCOTLAND, W.	a	60	40	50	87
"	b	27	47	37	
"	c	10	7	9	
"	d	3	6	4	
ENGLAND, N.W.	a	43	63	53	85
"	b	37	27	32	
"	c	17	7	12	
"	d	3	3	3	
ENGLAND, S.W.	a	50	57	54	74
"	b	27	13	20	
"	c	20	10	15	
"	d	3	20	11	
IRELAND, N.	a	10	70	40	72
"	b	47	17	32	
"	c	27	3	15	
"	d	16	10	13	
IRELAND, S.	a	23	43	33	70
"	b	40	33	37	
"	c	20	7	13	
"	d	17	17	17	
SUMMARY.					
BRITISH ISLES	a	43	55	49	82
"	b	37	29	33	
"	c	15	7	11	
"	d	5	9	7	

Reported—That Miss Rose E. Smith had been appointed to the vacancy caused by Miss Harris's death, on the terms fixed by the Council. (Minutes, p. 64.)

The Chairman stated that he had authorised C. A. Bracey, who had been in the Office 11½ years, to be promoted to the grade of fourth-class clerk, on the recommendation of the Secretary (M.O. 84). Salary to commence at 60*l.*, from January 1, 1891; increments to commence April 1892.—Approved.

Submitted—The following list of publications which had been received since the last meeting :—

Perpignan, Commission Météorologique.—Bulletin météorologique annuel du Département des Pyrénées Orientales. 1889.

Fines, Dr.—Revue climatologique, météorologique, agricole et sanitaire de l'année 1889 à Perpignan.

Hamburg, Deutsche Seewarte.—Resultate meteorologischer Beobachtungen von Deutschen und Holländischen Schiffen für Eingradfelder des nordatlantischen Ozeans. Quadrat 149. No. IX.

Sturge, R. F.—Thirty years' weather at Bristol from 1860 to 1889.

Turin, Società Meteorologica Italiana.—Annuario meteorologico italiano. Anno VI. 1891.

Santillán, R. A.—Bibliografía meteorológica Mexicana.

London, Meteorological Office.—Report of the Meteorological Council for the year ending 31st of March 1890.

St. Petersburg, Kaiserliche Akademie der Wissenschaften.—Repertorium für Meteorologie. Bd. XIII.

Bucharest, Academia Romana.—Analele. Seria ii. Tom. XI.-XII. 1889-90.

Colley, R., Michkine, N., et Kazine, N.—Observations actinométriques à l'observatoire météorologique de l'Académie Petrovsky près de Moscou.

Sprung, A.—Bericht über vergleichende Beobachtungen an verschiedenen Thermometer-Aufstellungen zu Gross Lichterfelde.

—— Ueber die Theorien des allgemeinen Windsystems der Erde, mit besonderer Rücksicht auf den Antipassat.

Sprung, R., u. Fuess, R.—Neue Registrirapparate für Regenfall und Wind, mit elektrischer Uebertragung.

San Fernando, Instituto y Observatorio de Marina.—Catálogo de la Biblioteca.

Stuttgart, Meteorologische Centralstation.—Meteorologische Beobachtungen in Württemberg. 1888.

Turin, Osservatorio della R. Università.—Osservazioni meteorologiche, 1889.

Paris, Service Hydrométrique du Bassin de la Seine.—Observations sur les cours d'eau et la pluie centralisées pendant l'année 1889.

—— Résumé des observations centralisées pendant l'année 1889.

63, Victoria Street, January 20, 1891.

PRESENT :

LIEUT.-GENERAL STRACHEY IN THE CHAIR.

MR. BUCHAN.
PROFESSOR DARWIN.

MR. GALTON.
MR. STONE.

THE HYDROGRAPHER.

The Secretary was in attendance.

The Minutes of the last meeting (January 7) were read and confirmed.

Mr. Scott reported, as to the Broun MSS. (Minutes, p. 72), that he had ascertained from Mrs. Broun (Letter, M.O. 98), that she had no more scientific papers of her late husband's in her possession. He further reported that there were in the Office two boxes of papers which had been sent by Mrs. Broun, at a date subsequent to the despatch of the 31 volumes referred to in the Minute above mentioned. The papers in these boxes referred to Makerstoun, Trevandrum, and other stations, as appeared from a cursory examination. A more detailed inventory of them would be submitted to the Council as soon as it could be prepared.

Reported—With reference to the proposed purchase of Westwood House (Minutes, p. 71), that the following letter had been received from the Treasury :—

SIR,

Treasury Chambers, 9th January 1891.

I AM directed by the Lords Commissioners of Her Majesty's Treasury to state, in reply to your letter of the 5th instant, that their Lordships raise no objection to the proposal of the Meteorological Council to purchase at the price, £1,400, the leasehold premises at Valencia, Ireland, which it is desired to acquire for the purposes of a permanent Observatory Station, and which lease it is proposed should be purchased in the name of the Royal Society, who would conduct the necessary formalities connected with the conveyance, and who would virtually act as trustees on behalf of the Treasury in the matter.

My Lords assent, on condition that in the event of the lease being sold the proceeds of the sale will be held subject to the decision of this Board, as representing money provided by vote of Parliament.

I am, &c.
(Signed) FRANK MOWATT.

The Secretary to the Meteorological Council,
63, Victoria Street, S.W.

On receipt of this letter, inquiry had been made by telegram on the 10th inst. from the executors of Miss Needham as to their readiness to sell the lease for 1,400*l*. (Letter, M.O. 113). The reply being in the affirmative, the following letter had been written to the Royal Society on the 12th inst. :—

SIR,

I AM directed by the Meteorological Council to forward, for the consideration of the President and Council of the Royal Society, copies of letters that have passed between the Meteorological Office and the Treasury relative to the proposed purchase of the lease of a house at Valencia, in Ireland, for an observatory in place of the present building now so used.

The Meteorological Council being satisfied that, so long as the meteorological services at present conducted under their supervision are maintained, an observatory at Valencia will be necessary, have been led to the conclusion that it is very desirable to take advantage of an opportunity that has now presented itself of securing, for what may be practically regarded as a permanency, a building much more conveniently situated and otherwise more suitable than the house now occupied for this purpose.

The constitution of the Meteorological Council and their dependence on the annual Parliamentary grant would make it impossible for them to enter into an agreement such as is involved in the purchase of a lease for a long term of years; and it has occurred to them that the object they have in view might be easily attained if the Royal Society would agree to become the purchasers of the lease, the purchase money and ground rent, together with all other liabilities, being at the entire charge of the Meteorological Office.

The Meteorological Council have at their command a sufficient sum to purchase the lease, viz., £1,400, and they can without any difficulty meet all other charges that may arise in connexion with the transaction.

They considered it to be essential to solicit the approval of the Treasury to the arrangement before addressing the Royal Society, and they have now obtained this necessary authority, and have also been informed that the representatives of the present leaseholders are prepared to sell for the sum already named.

Together with the letters before referred to, I also have the honour of forwarding, for the information of the President and Council of the Royal Society, a copy of the lease, which, it will be seen, is held from Trinity College, Dublin, for the residue of a term of ninety-nine years, of which about twenty-five years have expired. The obligations under the lease are not in any way onerous or likely to give trouble in the future.

Should the President and Council of the Royal Society assent to this proposal, as it is hoped they may do, there would seem to be no necessity for entering into any formal agreement between the Society and the Meteorological Council, which is in fact a Committee of the Royal Society, recognised by the Treasury for the discharge of certain duties. The contemplated arrangement would constitute the Royal Society the absolute owners of the lease, on the understanding, 1st, that all pecuniary liabilities would be discharged by the Meteorological Council from the funds at its disposal; 2nd, that in the event of circumstances arising, of whatever nature, to lead the Royal Society to desire to sell the lease or otherwise dispose of it, they should have full power to do so at their discretion; and 3rd, that in the event of the lease being sold the net proceeds should be held at the disposal of the Treasury, as required by their letter.

At the same time I am to add that should the President and Council of the Royal Society be of opinion that any special precautions are required to protect their interests, the Meteorological Council will endeavour to meet their wishes so far as is practicable.

To the Secretary of the
Royal Society.

The following reply had been received :—

Royal Society, Burlington House,
January 17, 1890.

SIR,

YOUR letter dated January 12, 1891, has been laid before the President and Council of the Royal Society, and I am directed to reply as follows :—

The President and Council are willing to become the purchasers of the lease of the house at Valencia, in Ireland, on the conditions named in your letter, viz. :

1. That the Meteorological Council should pay the sum demanded for the lease, viz., 1,400*l.* (fourteen hundred pounds), and all the costs of the purchase, and defray all other pecuniary liabilities connected with it, such as ground rent, rent and taxes, costs and repairs, including those rendered necessary by fire, storm, or tempest, insurance, &c. as stated in the lease.

2. That the Royal Society should have the power to sell the lease or otherwise dispose of it, should such a course seem to them at any time desirable.

The President and Council on their part undertake in the event of the lease being sold to place the net results of such sale at the disposal of My Lords of the Treasury, as required by their letter of January 9, 1891.

I am, &c.
(Signed) M. FOSTER,
Sec., R.S.

R. H. Scott, Esq., Secretary,
Meteorological Council.

Mr. Scott stated that he had inquired of the executors the name of their solicitor, for the information of the Royal Society (P.C. 149), and communicated it to Prof. M. Forster.

Read—A letter from Mr. Baillie stating, that since last meeting 4 logs had been received all of them being “excellent.” Mr. Scott was instructed to convey the best thanks of the Council to the observers, and to present the charts (O. 27) to Mr. W. G. Squares, S.S. “Minia.”

Submitted—The following summary, as a result of the primary checking of the storm warnings issued to the coasts of the British Islands since the last meeting of the Council :—

1. WARNINGS ISSUED.

SUMMARY.

A + B (successful)	-	-	-	-	-	= 20
C (failures)	-	-	-	-	-	= 13

2. GALES EXPERIENCED, BUT FOR WHICH NO WARNINGS WERE ISSUED.

None.

(Signed) FREDC. GASTER.

Telegraphic Branch,
20th January 1891.

Submitted—The following statement of accounts for the nine months ending 31st December 1890 :—

[illegible]

* Some expenses under this head not yet brought to account.

Mr. Scott stated (Minutes, p. 73) that on the recommendation of the local Inspecting Commander, New Quay had been adopted as a sea temperature station instead of Port Isaac.

Mr. Scott said that Mr. C. Harding had applied for leave to use Office data in the preparation of a paper on the existing severe weather, entrusted to him by the Council of the Royal Meteorological Society—Leave granted.

Submitted—The following list of publications which had been received since the last meeting :—

Kew Observatory.—Report of the Kew Committee for the year ending October 31st, 1890.

Whipple, G. M.—On the change of mean daily temperature which accompanies thunderstorms in Southern England.

— A brief notice respecting photography in relation to meteorological work.

Agamennone, G.—Il terremoto a Roma del 23 Febbraio 1890 ed il sismometrografo Brassart.

Merrifield, J.—Meteorological summary for Plymouth for the year 1890.

London, Registrar-General.—Fifty-second annual report. 1889.

Cambridge (Mass.), New England Meteorological Society.—Bulletin. Appendix for the year 1889.

— — Investigations of the New England Meteorological Society for the year 1889. An investigation of the sea breeze.

Glyde, E. E.—Seventh and eighth reports (2nd series) of the committee on the climate of Devon.

— Abstract of meteorological observations made at Kirkham, Babbacombe, Torquay, during the year 1890.

Brisbane, Chief Weather Bureau.—Special report on the floods of 1890, with notes on the meteorology of previous seasons.

Greenwood, W. N.—Kludonometric tide tables for the United Kingdom. 1891.

— Kludonometric pocket tide tables for the Lancashire Coast and Bristol Channel. 1891.

63, Victoria Street, February 4, 1891.

PRESENT :

LIEUT.-GENERAL STRACHEY IN THE CHAIR.

PROFESSOR DARWIN.
MR. GALTON.

MR. STONE.
THE HYDROGRAPHER.

The Secretary was in attendance.

The Minutes of the last meeting (January 20) were read and confirmed.

Submitted—The following memorandum (Minutes, p. 77) :—

SIR,

February 2, 1891.

IN accordance with your directions I have made a cursory examination of the contents of two large boxes, said to contain MSS., received from Mrs. Allan Broun in December 1880, for "safe keeping," which hitherto have not been examined. They consist of tabulations and drafts of memoirs relating to work at Makerstoun and Trevandrum. They were in an intermingled and confused arrangement, and have now been sorted into three lots :—

Box No. 17.—Papers placed in this box refer chiefly to work at Makerstoun, and are contained in eight cahiers and one brown paper parcel.

Box No. 19.—In this box have been deposited :—

1. Papers relating to magnetical work at Trevandrum.
2. Rough note-books, Nos. 1–30, observations of magnetometers.
3. Rough note-book, clock observations, 1864–65.
4. Simla magnetical observations, in brown paper parcel.

Lot 3 contains tabulations and drafts of memoirs relating to meteorological work in India. Of these a list (not printed here) has been made which is annexed hereto.

R. H. Scott, F.R.S.,
Secretary, Meteorological Council.

Your, &c.
(Signed) R. STRACHAN.

Mr. Scott was instructed to forward the papers in Lot 3 to Mr. Eliot, and to request Mr. W. Ellis, of Greenwich Observatory, to be so kind as to give an opinion as to the value of the magnetic and other data which are not to be sent to India.

Submitted—The following report on the 8.30 p.m. forecasts for January 1891 :—

The letters used have the following signification :—

a=complete success.

b=partial (i.e., more than half) success.

c=partial failure.

d=total failure.

DISTRICTS.		Percentages.			Percentage of Success. a + b.
		Wind.	Weather.	Average Forecast.	
SCOTLAND, N.	a	45	61	53	89
"	b	45	26	36	
"	c	10	0	5	
"	d	0	13	6	
SCOTLAND, E.	a	61	58	60	87
"	b	29	26	27	
"	c	10	0	5	
"	d	0	16	8	
ENGLAND, N.E.	a	58	65	62	92
"	b	39	22	30	
"	c	3	3	3	
"	d	0	10	5	
ENGLAND, E.	a	61	49	55	94
"	b	32	45	39	
"	c	7	3	5	
"	d	0	3	1	
MIDLAND COUNTIES	a	58	71	65	94
"	b	36	23	29	
"	c	3	3	3	
"	d	3	3	3	
ENGLAND, S.	a	58	65	62	96
"	b	39	29	34	
"	c	0	6	3	
"	d	3	0	1	
SCOTLAND, W.	a	58	58	58	83
"	b	23	26	25	
"	c	16	3	9	
"	d	3	13	8	
ENGLAND, N.W.	a	55	55	55	86
"	b	32	29	31	
"	c	10	6	8	
"	d	3	10	6	
ENGLAND, S.W.	a	52	71	62	87
"	b	35	16	25	
"	c	13	10	12	
"	d	0	3	1	
IRELAND, N.	a	39	52	46	81
"	b	42	29	35	
"	c	10	13	12	
"	d	9	6	7	
IRELAND, S.	a	48	49	49	75
"	b	23	29	26	
"	c	10	6	8	
"	d	19	16	17	
SUMMARY.					
BRITISH ISLES	a	54	60	57	88
"	b	34	27	31	
"	c	8	5	6	
"	d	4	8	6	

Submitted—The following statement respecting the Records for July to December, 1890, received from the Self-recording Observatories (see Minutes, 21st December, 1868; 20th November, 1876; 3rd January, 1883; and 6th March, 1889):—

JULY—DECEMBER.	ABERDEEN.		ARMAGH.		FALMOUTH.		FORT WILLIAM.		KEW.		VALENCIA.	
ANEMOGRAPH :—	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.
<i>Action of Instrument</i> -	Good.	Good.	Good.	Fair.	Good.	Good.	—	—	Good.	Good.	Good.	Good.
<i>Records deficient :—</i>												
Due to stoppage of clock	0	0	0	0	0	0	—	—	0	0	3 hrs.	3 hrs.
„ other causes -	2 hrs.	0	1 hr.	1 hr.	6 hrs.	7 hrs.	—	—	1 hr.	1 hr.	10 hrs.	13 hrs.
<i>No. of errors discovered :—</i>												
By general examination	12	0	9	26	16	1	—	—	0	1	18	3
<i>Rslts. of 40 Remeasmts. :—</i>												
Greatest difference	1·0	2·0	1·0	2·0	1·0	2·0	—	—	1·0	1·0	1·0	2·0
Mn. diff. irrespectv. of sign	0·2	0·5	0·2	0·4	0·2	0·6	—	—	0·1	0·4	0·3	0·5
Residl. diff. (— M. O.) -	0·0	0·0	0·0	+0·1	+0·1	0·0	—	—	0·0	0·0	0·0	0·0
<i>Orientation verified</i> -	Monthly	—	Monthly	—	Monthly	—	—	—	Monthly	—	Monthly	—
RAIN-GAUGE :—												
<i>Action of Instrument</i> -	Good.		Good.		Fair to Good.		Very imperfect.		Good.		Fair to Good.	
<i>Records deficient :—</i>												
Due to stoppage of clock	0		24 hrs.		0		0		0		22 hrs.	
„ other causes -	4 hrs.		5 hrs.		0		1 hr.		0		2 hrs.	
<i>No. of errors discovered :—</i>												
By general examination	7		5		9		18		2		27	
—	ABERDEEN.		FALMOUTH.		FORT WILLIAM.		KEW.		VALENCIA.			
BAROGRAPH :—												
<i>Action of Instrument</i> -	Good.		Good.		Good.		Good.		Good.		Good.	
<i>Character of Photography</i>	Do.		Do.		Do.		Do.		Do.		Do.	
<i>Records deficient :—</i>												
Due to stoppage of clock	0		5 hrs.		3 hrs.		0		0		3 hrs.	
„ failure of light -	0		1 hr.		61 hrs.		5 hrs.		0		0	
„ other causes -	2 hrs.		6 hrs.		20 hrs.		0		0		13 hrs.	
<i>No. of errors discovered :—</i>												
In entry of standards -	0		3		13		4		0		0	
„ calculating residuals -	0		3		9		2		1		1	
„ applying „ -	0		5		22		4		1		1	
By general examination -	0		11		33		8		26		26	
<i>Rslts. of 40 Remeasmts. :—</i>												
Greatest difference	·006		·009		·011		·007		·007		·007	
Mn. diff. irrespectv. of sign	·002		·002		·002		·002		·002		·002	
Residl. diff. (— M. O.) -	·000		·000		·000		·000		·000		·000	
<i>Mn. monthly diff. between simultaneous Bar. and Stand. Bar. readings</i>	·001		·002		·002		·002		·002		·002	
THERMOGRAPH :—												
<i>Action of Instrument</i> -	Good.		Good.		Good.		Good.		Good.		Good.	
<i>Character of Photography</i>	Do.		Do.		Do.		Do.		Do.		Do.	
<i>Records deficient :—</i>												
Due to stoppage of clock	Dry. 1 hr.	Wet. 1 hr.	Dry. 0	Wet. 0	Dry. 0	Wet. 0	Dry. 0	Wet. 0	Dry. 0	Wet. 0	Dry. 3 hrs.	Wet. 3 hrs.
„ failure of light -	0	0	1 hr.	1 hr.	1 hr.	4 hrs.	0	0	0	0	4 hrs.	11 hrs.
„ impetly. moist. bulbs	—	1 hr.	—	4 hrs.	—	34 hrs.	—	7 hrs.	—	—	—	6 hrs.
„ partly. frozen bulbs	—	57 hrs.	—	15 hrs.	—	43 hrs.	—	69 hrs.	—	—	—	11 hrs.
„ other causes -	7 hrs.	7 hrs.	11 hrs.	11 hrs.	4 hrs.	3 hrs.	0	0	0	0	3 hrs.	3 hrs.
<i>No. of errors discovered :—</i>												
In entry of standards -	1	0	9	9	9	23	0	0	4	4	4	4
„ maxima and minima -	2	—	7	—	29	—	2	—	9	—	9	—
By general examination -	1	3	12	23	25	30	8	4	20	16	20	16
<i>Rslts. of 40 Remeasmts. :—</i>												
Greatest difference	0·2	0·2	0·3	0·2	0·7	0·7	0·2	0·2	0·2	0·2	0·2	0·2
Mn. diff. irrespectv. of sign	0·1	0·1	0·1	0·1	0·2	0·3	0·1	0·1	0·1	0·1	0·1	0·1
Residl. diff. (— M. O.) -	—0·1	0·0	0·0	0·0	+0·1	—0·1	0·0	+0·1	0·0	+0·1	0·0	0·0
<i>Mn. monthly diff. between simultaneous Ther. and Stand. Ther. readings</i>	0·2	0·2	0·1	0·2	0·2	0·2	0·1	0·2	0·2	0·2	0·2	0·2

Aberdeen.

Anemograph, Rain-gauge, and Barograph.—Instruments working in a satisfactory manner.

Thermograph.—The differences between the readings of the standard thermometer and the corresponding values of the thermograph were unusually large during July. The zero lines were changed from the summer to winter position on October 2nd.

General.—Instruments cleaned and inspected on the 21st August. The tabulation of the barograph and thermograph curves from the 6th July—16th August was done at the Meteorological Office.

Armagh.

Anemograph.—The velocity traces are intermittent at low rates, owing to a mechanical defect, and orientation is not tested monthly.

Rain-gauge.—The discharger does not appear to have worked perfectly during August, the trace representing a fall of .200 in. being considerably short. The total by the check gauge was .331 in. in excess of the self-recording gauge; this is the more noticeable from the fact that with Dr. Dreyer's observations the agreement between the two gauges is generally very good. The beginning and ending of the traces do not always agree with the times given.

General.—Instruments were examined and cleaned on the 7th October.

Falmouth.

Anemograph.—Working satisfactorily.

Rain-gauge.—Traces unsteady at times, and there are apparent signs of bagging, probably caused by the use of badly printed papers which should have been rejected.

Barograph.—Slight blur to the lower edge of trace at the beginning of the period, but subsequently the definition is perfect.

Thermograph.—Secondary images were noticeable on the curves at times. The zero lines were changed from the summer to winter position on the 21st.

General.—The instruments were examined and cleaned on the 20th and 21st October. Copying was detected in the September work, and special reports thereon were made to Mr. Fox.

Fort William.

The observations were commenced at this observatory on Monday, July 14th, from which date continuous registration has been obtained and forwarded to the Meteorological Office for examination.

Rain-gauge.—The working of this instrument has been very imperfect and unsatisfactory, and the hourly values at times unreliable. The July work had to be retabulated for various reasons, and the attachment of the papers was indifferent. Disagreement between the stated times of beginning and ending, and the ends of the traces was frequent. As an additional check upon the action of this gauge, instructions were given to measure the fall of rain collected in the receiver in the measuring glass. The measured values are invariably higher than the traces, and small quantities are sometimes shown of which there is no trace on the curve. The totals by the measuring glass and the check gauge agree fairly well. It is not advisable to use the daily or hourly totals as shown by the traces. Attention has been specially drawn to this subject.

Barograph.—Some hours of the lower edge of trace was lost on November 2nd, owing, it was thought, to the mercury being out of focus (28.878 ins.). The tube was raised at 2.30 p.m. on the 6th, but without the desired result, and was again lowered into its original position at 10.30 a.m. on the 7th. The question having been referred to the Meteorological Office, instructions were given to lessen the quantity of mercury in the tube, and on the 13th 2¼ ounces were withdrawn with satisfactory results (see curve 318-319).

Thermograph.—On the 15th July "the shield of the wet-bulb slipped down." Shield subsequently suspended by a hook (see M.O. 1614) and position changed. The position of the wet-bulb was altered on the 18th October, and breadth of the zero line increased. The zero lines vary considerably in breadth, and the Journal times of beginning and ending do not always agree with the ends of traces. Greater care is necessary in tabulating the hourly values, as the differences are numerous and large. The zero lines were changed from summer to winter position on the 4th November.

Kew.

Anemograph.—The instrument was cleaned and oiled on 19th September, and oiled on the 8th November.

Rain-gauge.—Instrument working satisfactorily.

Barograph.—There is a penumbra to the lower edge of the traces, which is probably caused by the light being too strong.

Thermograph.—The definition of the traces was very indifferent during November, and a reduction of light was suggested. On the 20th November a flaw was detected in the wet-bulb tube (see M.O. 2038.) In December a paraffin lamp for use at Fort William was tested with satisfactory results, the definition being good and better than with the gas (see curve 344-345.) The zero lines were changed from the summer to winter position on the 27th October.

Valencia.

Anemograph.—Working satisfactorily.

Rain-gauge.—The traces are somewhat faint and the action of the instrument is occasionally open to suspicion. The totals by the check gauge are frequently considerably higher than those by this gauge, and small amounts are sometimes registered by the former when there is no record by the Beckley.

Barograph.—Definition somewhat imperfect, and lamp was out of position, causing a double edge to lower part of trace, in November.

Thermograph.—Curves disfigured by secondary images caused by an imperfection on the tube of the dry bulb, and definition indifferent at times. The wet-bulb zero lines are very intermittent. On 20th December the position of the dry-bulb condenser was changed and trace reduced in breadth, the definition being improved; on curve 360–361, however, the condenser appears to have been restored to its original position (see 2 p.m. 26th). The zero lines were changed from summer to winter position on the 30th September.

General.—The instruments were inspected and cleaned on the 11th–14th October.

(Signed) THOMAS E. ALLEN.

Reported—That a letter (No. 209) had been received from the Colonial Office, stating that the Colony of St. Helena could not afford to purchase instruments this year (Minutes, p. 73), and that a letter (P.C. 225) had been written offering to lend the necessary instruments to the Colony.—Approved.

Read—Letter 237 from the Reverend W. Ford, Valua Island, Banks Group (Minutes, 1887, p. 81), saying that the rain-gauge presented to him had arrived safely, and asking for an anemometer. Mr. Scott was instructed to complete Mr. Ford's outfit of instruments, and to supply a hand anemometer.

Read—A letter from Mr. Baillie stating that since last meeting seven logs had been received, six of them being "excellent." Mr. Scott was instructed to convey the best thanks of the Council to the observers.

Submitted—The following summary, as a result of the primary checking of the storm warnings issued to the coasts of the British Islands since the last meeting of the Council :—

1. WARNINGS ISSUED.

SUMMARY.

A + B (successful)	-	-	-	-	=	27
C (failures)	-	-	-	-	=	8

2. GALES EXPERIENCED, BUT FOR WHICH NO WARNINGS WERE ISSUED.

None.

(Signed) FREDC. GASTER.

Telegraphic Branch,
February 4, 1891.

Submitted—The following statements of work during the month of January 1891 :—

MARINE BRANCH.

February 4, 1891.

Examined 12 new logs and one lighthouse register.

Extracting information from Office logs in the district between the Cape of Good Hope and New Zealand, and obtaining tentative means of barometer and air and sea temperature in single-degree squares to test the value of the data already used.

Charting ocean currents from the Remark Books of H.M. ships, lent for the purpose by the Hydrographic Department. 800 Remark Books were received during the month.

Preparing tables of gale frequency in the Red Sea and Arabian Sea, and examining the remarks from logs bearing upon local currents and abnormal changes in sea temperature.

(Signed) CHAS. HARDING.

The Marine Superintendent.

Forwarded for the information of the Council.

(Signed) C. W. BAILLIE.

TELEGRAPHIC (FORECAST AND STORM WARNING) BRANCH.
(To 31st January 1891.)

Telegraphic Branch,
February 4, 1891.

Quarterly Weather Report, 1880.—Tables, maps, &c. for Third Quarter, prepared and handed in.

Monthly Weather Report, 1887.—All numbers up to *September* gone finally "for press." *October*, *November*, and *December* are in "proof," and *October* is partly revised.

Weekly Weather Report, 1890:—

All numbers issued promptly.

Appendix I. complete for all quarters and entire year.

Appendices II., III., and IV. are all in proof, have been revised and returned to printer "for press." The copies are expected this week.

Supplement (Monthly Summary).—All numbers to *September* issued; *October* now due from printer; *November* is in printer's hands "for press"; and *December* copy is at printer's; proof expected this week.

Title-page and Preface is in printer's hands; proof expected this week.

Weekly Weather Report, 1891.—All numbers issued promptly to date. *Appendices, &c.* are in hand.

Daily Weather Report, 1890.—All issued, with *Monthly Correction Sheets, Title-page, and Frontispiece* complete.

Daily Weather Report, 1891.—All numbers issued promptly to date.

Primary Checking of Storm Warnings Issued.—Done to date.

Primary Checking of Daily Forecasts.—Done to date.

Checking of Hay Harvest Forecasts, 1890.—Completed. Report will be submitted this week.

New Averages of Pressure, Temperature, Rainfall, and Bright Sunshine, referred to in recent reports, have been almost completed, and are in full use in *Daily and Weekly Reports, and Monthly Summaries.*

(Signed) FREDC. GASTER.

PANTAGRAPH ROOM.

January 31, 1891.

Harmonic Analysis of Hourly Readings.—Further alterations have been made in the tables of this work, the progress of which through the press has been again delayed in consequence.

Hourly Means.—The calculation of the means for 1888 is making satisfactory progress. The revision of the proofs of the tables for 1887 has not been advanced during the month, the printer not having sent in any more sheets.

Miscellaneous.—The mean values of the Kew Report to the end of 1890 have been completed. A diagram has been drawn for use in measuring cloud photographs. The usual routine work of the room kept up to date.

(Signed) R. H. CURTIS.

R. H. Scott, Esq., F.R.S.

EXAMINATION BRANCH.

February 2, 1891.

Examinations.

December 1890.—Work for all observatories completed.

Weekly examination (on receipt) of the curves and documents.

Reports, &c.

December 1890.—Copies of the "*Notes of Errors*" to all observatories.

General.

The *Diurnal Range of Rainfall, 1881–1890,* proceeded with.

Various routine matters have also occupied much of Messrs. Parsons and Hewitt's time.

(Signed) T. E. ALLEN.

Reported—That the following instruments had been ordered for stock:—

	£	s.	d.
6 rain-gauges - - - - - cost	12	0	0
6 solar thermometers - - - - -	6	0	0
	£18	0	0

Submitted—The following list of publications which had been received since the last meeting:—

London Royal Meteorological Society.—Catalogue of the Library.

Ellis, W.—On the difference produced in the mean temperature derived from daily maximum and minimum readings, as depending on the time at which the thermometers are read.

— On the relative prevalence of different winds at the Royal Observatory, Greenwich, 1841–1889.

— On the diurnal variations of magnetic elements, as depending on the method of tabulation.

New Zealand.—Observations on the climate of the North Island of New Zealand.

Melbourne Observatory.—Twenty-fifth report of the Board of Visitors.

Haviland, A.—Scarborough as a health resort.

Bezold, W. V.—Das königlich preussische meteorologische Institut in Berlin und dessen Observatorium bei Potsdam.

Berlin, K. Preussisches Meteorologisches Institut.—Abhandlungen. Bd. I. No. 1–3.

Tacubaya, Observatorio Astronómico Nacional.—Anuario. 1891.

- Singer, K* —Wolkennamen und Wolkenphotographie.
Devon.—Reports of the Committee on the climate of Devon. 1st to 6th (second series). 1881–86.
Prior, R. C. A.—Coldest days of the last fifty winters.
Mauritius, Royal Alfred Observatory.—Annual report. 1888.
 ——— Results of meteorological observations. 1889.
Hellmann, G.—Die Regenverhältnisse vom 22 bis 24 November 1890 in Mittel- und Westdeutschland.
Venice, Osservatorio del Seminario Patriarcale.—Annuario astro-meteorologico con effemeridi nautiche per l'anno. 1891.
Manchester, Sheffield, and Lincolnshire Railway.—Monthly statement of rain fallen in the year ending 31st December 1890.
McLandsborough, J., and Preston, A. E.—Meteorology of Bradford for 1890.
Lang, C.—Bühler's Hagelstatistik und vorläufige Mittheilung einer säkularen Periode der Hagel- und Blitz-Gefahr.
Ellis, W.—Map showing lines of equal magnetic declination for January 1, 1891.

63, *Victoria Street*, February 18, 1891.

PRESENT :

LIEUT.-GENERAL STRACHEY IN THE CHAIR.

MR. BUCHAN.

PROFESSOR DARWIN.

MR. GALTON.

MR. STONE.

THE HYDROGRAPHER.

The Secretary was in attendance.

The Minutes of the last meeting (February 4) were read and confirmed.

Reported—That the Broun MSS. had been forwarded to the India Store Department for transmission to Calcutta, as directed, and that Mr. Ellis had kindly consented to examine the documents relating to magnetism and the Makerstoun observations, which had not been sent to India.

Reported—That the Stationery Office (Letter 324) had fixed the subscription for the Weekly Weather Report at 1*l.* 10*s.* to cover all appendices, &c., and that Messrs. Eyre and Spottiswoode were willing to allow the Office to receive subscriptions for the publication and account for the same to them.

Submitted—The following report on the sea temperature on the coasts of the British Isles which had been prepared at the request of the Hydrographer :—

REPORT ON SEA TEMPERATURES.

SIR,

IN accordance with your directions I have examined the returns from the Sea Temperature Stations for the last quarter of 1890, and have to report as follows :—

October 1890.—Starting from the Thames northward the mean temperature of the sea was 57° at the Shipwash, and decreased to 50°·9 at Sunderland. Thence a slight increase occurred to Burnmouth, 52°·5, but the regular decrease continued to Kirkwall, 47°·6, and an increase to Lerwick, 49°·3. Stornoway, 53°·1, was much higher than the east coast. Portrush, 54°·4, increased to 55°·0 at Teelin. On the west of Ireland the mean temperature varied between 55°·7 and 53°·3. For the south and east of Ireland observations are defective. At Daunt's rock it was 55°·8. The west coast water of England was slightly warmer than the east. Lamlash, 53°·7, decreased to 52°·6 in the Solway. At the North-West Lightship it was 54°·9, in the Irish Sea 56°, increasing to 57°·5 in the Bristol Channel. The Seven Stones, 56°·6, increased to 59°·1 at the Owers, and thence decreased to the Thames.

The British seas were warmer than usual, and warmer than the mean temperature of the atmosphere for the month. The water was observed to be coldest on the 27th, the day before or the day after, at almost all the stations.

November 1890.—From the Newarp Lightship, 46°·8, the mean temperature of the sea increased to 50°·7 at the Outer Dowsing, fell to 44°·5 at Scarborough, rose to 50°·2 at Burnmouth, went down to 44°·2 at Cromarty, whence it increased to 47°·8 at Kirkwall, though at Lerwick it was only 45°·5, Stornoway had 44°·9. The Irish Sea at 58° was as warm as the English Channel.

The west of Ireland ranged from 47°·5 to 49°·5. Daunt's Rock had 50°·7. From 49°·9 at Lamlash it decreased to 45°·1 in the Solway, rose to 48°·9 at the North-West Lightship, and to 53°·4 in Carnarvon Bay; thence it decreased to 49°·5 in the Bristol Channel. At the Seven Stones the temperature was 53°·7, and about the same up Channel to Beachy Head, whence it decreased to the Thames.

The temperature of the sea was noticeably colder after the 26th. The mean temperature of the sea for the month was nearly normal.

December, 1890.—The temperature of the sea at the Shipwash, $41^{\circ} \cdot 4$, increased to $44^{\circ} \cdot 9$ at the Outer Dowsing, thence declined rapidly to $39^{\circ} \cdot 6$ at Sunderland, and rose as rapidly to $45^{\circ} \cdot 9$ at Montrose. More northward a decrease took place to $40^{\circ} \cdot 6$ at Cromarty and thence an increase to $44^{\circ} \cdot 3$ at Kirkwall, being at Lerwick only $43^{\circ} \cdot 1$. Stornoway, $38^{\circ} \cdot 9$, was colder than the east coast. Portrush, $44^{\circ} \cdot 5$, increased westward to $45^{\circ} \cdot 3$ at Dunfanaghy, fluctuated between 43° and 44° on the west coast, and was 47° on the south coast. The Irish Sea appears to have been above 49° , but the sea was much colder close to the English coast, $39^{\circ} \cdot 3$ at Solway, $43^{\circ} \cdot 2$ at the North-West Lightship, $41^{\circ} \cdot 1$ on the English and Welsh Ground. It was $50^{\circ} \cdot 6$ at Scilly, only $44^{\circ} \cdot 2$ at Salcombe, thence rose to $46^{\circ} \cdot 5$ at the Owers, whence it fell to the Thames.

The mean temperature of the sea was lower than usual, but not nearly so cold as the atmosphere. From the Thames to the Forth the east coast sea was about 2° colder than usual. The east coast of Scotland was rather warmer, the west colder than usual. Around Ireland the sea was from 2° to 4° colder than the normal. The Channel was from 1° to 5° colder than usual. The sea on the west of England was colder or warmer than the normal according as the stations are more or less landlocked.

The normal temperature is considered to be that shown by the "Meteorological Atlas of the British Islands."

Charts of the mean temperature of the sea in October, November, and December are appended hereto.

The Secretary, Meteorological Council.
16th February 1891.

Yours, &c.
(Signed) R. STRACHAN.

Mr. Scott reported that he had been requested by the Navigation Committee of the Royal Naval Exhibition to submit a scheme for the communication of weather intelligence to be posted up in the building. (Letter 285.)

Mr. Scott was authorised to state that the Council were ready to allow the information to be communicated if the cost were borne by the Committee of the Exhibition. (P.C. 399.)

Read—A report from Mr. Baillie, stating that since last meeting six logs had been received, three of them being excellent. Mr. Scott was instructed to convey the best thanks of the Council to the observers.

Submitted—The following summary as a result of the primary checking of the storm warnings issued to the coasts of the British Islands since the last meeting of the Council:—

(1.) WARNINGS ISSUED.

	Summary.				
A + B (successful)	-	-	-	-	= 5
C (failures)	-	-	-	-	= 2

(2.) GALES EXPERIENCED, BUT FOR WHICH NO WARNINGS WERE ISSUED.

None.

Telegraphic Branch,
18th February 1891.

(Signed) FREDC. GASTER.

Mr. Scott reported that he had completed a report on the sunshine records from April 1, 1880, to December 31, 1890. It was resolved that this be published officially in 8vo form, and that Mr. Scott inquire of Messrs. Eyre and Spottiswoode as to the possibility of advertising or otherwise extending the sale.

Submitted—The following list of publications which had been received since the last meeting:—

Cambridge (Mass.), New England Meteorological Society.—Report of the 7th annual meeting, referring specially to tornadoes.

Calcutta, Meteorological Office.—Preliminary report on the meteorology for the year 1889, prepared in the Meteorological Office, Government of India.

Utrecht, Koninklijk Nederlandsch Meteorologisch Instituut.—De stroomen op de Nederlandsche Kust.

Washington, Smithsonian Institution.—Annual report to July 1888.

Christiania, Den Norske Nordhavs-Expedition, 1876–1878.—XX. Zoologi. Pycnogonidea. Ved G. O. Sars.

London, R. Botanic Society.—Quarterly Record. 1880–90.

Decamps, L.—La neige et les cartes du temps.

Hellmann, G.—Höhe der Schneedecke am letzten 31 Januar 1891 in Norddeutschland.

63, Victoria Street, March 4, 1891.

PRESENT :

LIEUT.-GENERAL STRACHEY IN THE CHAIR.

PROFESSOR DARWIN.
MR. GALTON.

MR. STONE.
THE HYDROGRAPHER.

The Secretary was in attendance.

The Minutes of the last meeting (February 18) were read and confirmed.

Read—Letter 388 from the Royal Society, enclosing letters from Messrs. Few & Co. and Messrs. Barlee and Greer, relating to the purchase of some of the land belonging to Westwood House by the West Kerry Light Railway. Mr. Scott stated that by the Chairman's directions he had written to Mr. Halloran and Mr. Cullum (P.C. 444 and 449) asking for particulars, and he submitted their replies (Letters 418 and 419).

Mr. Scott was instructed to inform the Royal Society that the Council assented to the purchase of the land by the railway being completed by the proprietors of the estate, on the understanding that the sum received by them for the land should be deducted from the price to be paid by the Royal Society (P.C. 497).

Mr. Scott submitted a scheme for the exhibition of weather information at the Naval Exhibition (Minutes, p. 88), and he was instructed to ascertain if the Exhibition authorities would prefer a written account of the weather, or a large-scale map, to be supplied twice daily.

The Chairman stated that he had ascertained that the Council might probably obtain from the Board of Trade a license which would confer upon them the status of a corporate body, and that he had instructed Mr. Scott to forward the subjoined letter on the subject to the Royal Society :—

(P.C. 447.)

Meteorological Office, 63, Victoria Street, London, S.W.,
February 26, 1891.

SIR,

THE Meteorological Council have been informed that it is probable that the Board of Trade would, on a suitable application being made to them, grant the Meteorological Council a license under the Companies Act which would give them the status of a corporation, and guard against the possible inconveniences which might at any time arise in connexion with their business transactions from the peculiar constitution of their body.

I am therefore directed to request the President and Council of the Royal Society to give their assent to such an application being made, it being understood that it will involve no sort of liabilities on the Royal Society.

I am, &c.
(Signed) ROBERT H. SCOTT,
Secretary.

The Secretary, Royal Society.

Read—A report from Mr. Baillie, stating that since last meeting two logs had been received, one being "excellent."

Mr. Scott was instructed to convey the best thanks of the Council to the observer.

Submitted—The following summary as a result of the primary checking of the storm warnings issued to the coasts of the British Islands since the last meeting of the Council :—

1. WARNINGS ISSUED.

A + B (successful)	-	-	-	= 18
C (failures)	-	-	-	= 3

2. GALES EXPERIENCED, BUT FOR WHICH NO WARNING WAS ISSUED.

None.

Telegraphic Branch,
March 4, 1891.

(Signed) FREDC. GASTER.

Submitted—The following statements of work during the month of February 1891 :—

MARINE BRANCH.

March 4, 1891.

Examined 12 new logs and one lighthouse register.

Charting data from Office logs in the district between the Cape of Good Hope and New Zealand, and obtaining tentative means of barometer and air and sea temperatures.

For charting ocean currents 198 Remark Books of H.M. ships were received from the Hydrographic Department, the total number received in twelve months being 6,602. Having exhausted the Remark Books covering the period from 1862 to a part of 1889, permission has been granted by the Admiralty to use such original logs of H.M. ships between 1830 and 1862 as may be necessary. In February 310 volumes were obtained from the Public Record Office.

Revised proofs of the Guardafui charts examined.

Tables of gale frequency prepared for the Red Sea charts, and the data books examined for evidence of great fluctuations in the sea temperature near Perim.

Preparing various diagrams and current charts for the Naval Exhibition.

Indexing data in ocean 10-degree squares.

(Signed) CHAS. HARDING.

The Marine Superintendent.

Forwarded for the information of the Council.

(Signed) C. W. BAILLIE.

TELEGRAPHIC (FORECAST AND STORM WARNING) BRANCH.
(To February 28, 1891.)

March 4, 1891.

Quarterly Weather Report, 1880.—Tables, maps, &c. for fourth quarter, prepared.

Monthly Weather Report, 1887.—All numbers up to November gone finally "to press;" December nearly done.

Weekly Weather Report, 1890.—With Title-page, Appendices, and Monthly Supplements, all published.

Weekly Weather Report, 1891.—All numbers (to No. 7) issued promptly. *Monthly Supplement* for January nearly ready for printer.

Daily Weather Report, 1891.—All numbers issued promptly. Correction sheet for January issued.

Primary Checking of Storm Warnings.—Done to date.

Primary Checking of Daily Forecasts.—Done to date.

Final Checking of Storm Warnings, 1890.—New arrangements made for more accurate checking, necessary forms prepared, and ordered from printer.

During this month this Branch has suffered owing to the absence of Mr. Francis for eight days, he having being compelled to attend as juryman at the Middlesex Sessions, Clerkenwell.

(Signed) FREDC. GASTER.

PANTAGRAPH ROOM.

February 28, 1891.

Hourly Means.—The calculation of the mean values for the different elements for the year 1888 is making steady progress. The reading of the proof for 1887 is not yet completed, the sheets having been received but slowly from the printer.

Harmonic Analysis of Hourly Readings.—The checking of the proof sheets of this work has been carried on as quickly as the delivery by the printer would allow; the alterations in the tables, lately decided upon, necessitate a good deal of time being spent upon them.

Miscellaneous.—The engraving of a diagram required for use in reducing cloud photographs has occupied a good deal of time.

(Signed) R. H. CURTIS.

R. H. Scott, Esq., F.R.S.

EXAMINATION BRANCH.¹

March 2, 1891.

Examinations.

January 1891.—Work for all observatories completed.

Weekly examination (on receipt) of the curves and documents.

Reports.

July–December, 1890.—Monthly reports, and combined report to Council.

General.

The Diurnal Range of Rainfall, 1881–90 :—Proceeded with.

Various routine matters have also occupied much of Messrs. Parsons and Hewitt's time.

(Signed) T. E. ALLEN.

Submitted—The following report on the 8.30 p.m. forecasts for February 1891 :—

The letters used have the following signification :—

a=complete success.

b=partial (i.e. more than half) success.

c=partial failure.

d=total failure.

AUGUST.

DISTRICTS.		Per-centages.			Per-centage of Success a + b.
		Wind.	Weather.	Average Forecast.	
SCOTLAND, N.	a	43	71	57	84
"	b	32	21	27	
"	c	14	4	9	
"	d	11	4	7	
SCOTLAND, E.	a	64	68	66	82
"	b	11	21	16	
"	c	18	7	13	
"	d	7	4	5	
ENGLAND, N.E.	a	79	68	74	93
"	b	18	21	19	
"	c	3	0	2	
"	d	0	11	5	
ENGLAND, E.	a	75	72	74	88
"	b	7	21	14	
"	c	11	0	5	
"	d	7	7	7	
MIDLAND COUNTIES	a	68	79	74	88
"	b	14	14	14	
"	c	18	0	9	
"	d	0	7	3	
ENGLAND, S.	a	68	75	72	93
"	b	25	18	21	
"	c	7	0	4	
"	d	0	7	3	
SCOTLAND, W.	a	47	43	45	74
"	b	32	25	29	
"	c	21	4	12	
"	d	0	28	14	
ENGLAND, N.W.	a	64	50	57	80
"	b	14	32	23	
"	c	18	4	11	
"	d	4	14	9	
ENGLAND, S.W.	a	61	57	59	83
"	b	25	22	24	
"	c	11	0	5	
"	d	3	21	12	
IRELAND, N.	a	57	36	47	74
"	b	18	36	27	
"	c	11	10	10	
"	d	14	18	16	
IRELAND, S.	a	68	29	49	75
"	b	7	46	26	
"	c	11	21	16	
"	d	14	4	9	
SUMMARY.					
BRITISH ISLES	a	63	59	61	83
"	b	19	25	22	
"	c	13	5	9	
"	d	5	11	8	

Submitted—The following list of publications which had been received since the last meeting :—

Pekin, Inspectorate General of Customs.—Medical reports for the half year ended 30th September 1888.

St. Petersburg, Physikalisches Central Observatorium.—Annalen. Jahrg. 1889. Theil II.

Zürich, Schweizerische Meteorologische Central-Anstalt.—Annalen 1887.

Berg, E.—Über die Beobachtungen der Schneedecke im europäischen Russland in der ersten Hälfte von 1890.

Hamburg, Deutsche Seewarte.—Jahrbuch für 1889.

Seemann, C. H.—Wetterlexikon, ein Register zu den europäischen Wetterkarten von 1876–1885.

Nipher, F. E.—The State Weather Service.

Rykatschew.—Resultate der magnetischen Beobachtungen am Konstantinow'schen Mess-Institut in Moskau in den Jahren 1879–1888.

Edinburgh, Royal Society.—Transactions. Vol. xxxiv. Meteorology of Ben Nevis by A. Buchan.

63, Victoria Street, March 18, 1891.

PRESENT :

LIEUT.-GENERAL STRACHEY IN THE CHAIR.

MR. BUCHAN.

MR. GALTON.

MR. STONE.

THE HYDROGRAPHER.

The Secretary was in attendance.

The Minutes of the last meeting (March 4) were read and confirmed.

Read—A letter (No. 464) from Mr. Spence, of Stennes, Orkney (Minutes, p. 8), stating that he had been appointed to the school at Deerness in the same island, and proposing to bear the cost of transfer of the anemometer, &c. himself, if the Council would sanction their removal.

Mr. Buchan gave an explanation of the circumstances, and it was agreed to sanction the removal, and to allow a sum, not exceeding 5*l.*, towards its cost. (P.C. 594.)

Read—An application (Letter 492) from Mr. H. N. Dickson, of the Marine Biological Association, Plymouth, for access to the sea temperature records from the coasts of the British Islands which are being collected.

Mr. Scott was authorised to make the necessary arrangements for supplying Mr. Dickson with the information.

Mr. Scott was instructed to address the Agricultural Department again on the subject of the distribution of Hay Harvest Forecasts (Minutes, 1890, p. 12), enclosing a copy of the report on p. 92. (P.C. 707.)

Read—A letter from Mr. Baillie stating that since last meeting nine logs had been sent in, six being excellent. He recommended for the Charts (O. 27) :—

H.R.H. Prince George of Wales	} H.M.S. "Thrush."
Surgeon W. E. Home, R.N.	
Captain J. I. Nicholson	

Mr. Scott was directed to present the charts as proposed, and to convey the best thanks of the Council to the other observers.

Reported—That 300 thermometers were required on Admiralty account, at a cost of 105*l.*—Sanctioned.

Read—Letter 466 from Mr. Brodie, asking permission to use information in the Office in the preparation of a paper for the Royal Meteorological Society.—Sanctioned.

Submitted—The following summary as the result of a primary checking of the storm warnings issued to the coasts of the British Islands since the last meeting of the Council :—

1. WARNINGS ISSUED.

SUMMARY.

A + B (successful)	-	-	-	=	24
C (failures)	-	-	-	=	6

2. GALES EXPERIENCED, BUT FOR WHICH NO WARNINGS WERE ISSUED.

None,

but in the case of the Easterly gale of the 9th instant, the centre advanced so suddenly, and came from a direction in which we have so few observations, that the warnings issued to our south-west coasts were too late to be of any service.

(Signed) FREDC. GASTER.

Telegraphic Branch,
18th March 1891.

Submitted the following report :—

HAY HARVEST FORECASTS.

Meteorological Office, Telegraphic Branch,
March 17, 1891.

SIR,

I BEG to submit, herewith, the results of the checking of the Hay Harvest Forecasts during the hay-making period of 1890.

The telegrams were sent daily between 3.30 p.m. and 4 p.m. on each week-day for about five weeks, beginning on the 9th June in the Eastern and Southern districts of England, and ending on the 26th July over the greater part of England, and about a fortnight later in most parts of Scotland.

Notwithstanding the unsettled weather which prevailed during the summer months of last year the general per-centage of success again reached 89. The same degree of success was reached in 1889, which, to that date, was the highest recorded. The largest general per-centage (95) was reached in Scotland, E., while the smallest (86) was in England, E. In addition to the recipients named in the list, telegrams were sent to six other gentlemen at their own cost; among them Mr. J. Fergusson, of Thetford, remarks: "They (the forecasts) have been only too true" (Letter 1248/90), and Sir Richard Paget, of Shepton Mallet, says, "As a general rule they have been absolutely correct, and only very occasionally has there been a slight error in direction of "wind" (Letter 1453/90).

In Table II. will be found remarks added by several other of the recipients, speaking in high terms of the forecasts.

R. H. Scott, Esq., M.A., F.R.S.,
Secretary, Meteorological Council.

I am, &c.
(Signed) FREDC. GASTER.

TABLE I.—SUMMARY OF RESULTS.

Districts.	Names of Stations.	Per-centages.				Total Per-centage of Success.
		Complete Success.	Partial Success.	Partial Failure.	Total Failure.	
SCOTLAND, N. -	Munlochy and Golspie -	52	35	8	5	87
SCOTLAND, E. -	Aberfeldy, Glamis, and Rothiemay	53	42	5	—	95
ENGLAND, N.E.	Chatton and Ulceby -	57	31	10	2	88
ENGLAND, E. -	Rothamsted and Thorpe -	54	32	13	1	86
MIDLAND COUNTIES	Cirencester and East Retford -	50	42	6	2	92
ENGLAND, S. -	Reading, Maidstone, Downton, and Horsham.	52	42	6	—	94
SCOTLAND, W.	Strauraer, Islay, and Dumbarton	60	28	12	—	88
ENGLAND, N.W.	Leyburn and Prescott -	47	38	12	3	85
ENGLAND, S.W.	Tortworth, Clifton, Bridgend, and Glastonbury.	52	36	11	1	88
IRELAND, N. -	Moynalty and Edgeworthstown -	55	37	5	3	92
IRELAND, S. -	Tralee, Kilkenny, and Parsons-town.	50	37	9	4	87
	Mean for all districts -	53	36	9	2	89

TABLE II.—RETURN showing the NUMBER of FORECASTS sent to each of the under-mentioned PERSONS, with the SUCCESS or otherwise of the FORECASTS.

Districts.	To whom sent.	Addresses.	No. of Forecasts sent.	No. of Forecasts checked.	Per-centages.			Remarks.
					Complete Success.	Partial Success.	Partial Failure. Total Failure.	
0. SCOTLAND, N.	Major Smith	Munlochy, Inverness	30	30	53·3	36·7	3·3	Dr. Joass says, "The forecasts were much
	Rev. Dr. Joass	Golspie, N.B.	30	30	50·0	33·3	13·4	"appreciated in the neighbourhood."
1. SCOTLAND, E.	C. W. L. Forbes	Aberfeldy	30	30	53·3	40·0	6·7	Mr. J. Whitton, Glamis, remarks, "The
	J. Whitton	Glamis Castle, Glamis	24	24	45·8	45·8	8·4	"forecasts have been much prized by
	G. Murdoch	Rothiemay, Huntley	30	30	60·0	40·0	—	"those interested in the hay harvest."
2. ENGLAND, N.E.	Sir Jacob Wilson	Chillingham, Barns, Chatton, Northumberland.	78	65	67·7	24·6	6·2	
	J. Turner	The Grange, Ulceby	30	30	46·7	36·7	13·3	
3. ENGLAND, E.	W. Birkbeck	High House, Thorpe, Norwich	36	36	44·5	33·3	19·4	
	Sir J. B. Lawes, Bart.	Rothamsted, St. Albans	36	36	63·9	30·6	5·5	
4. MIDLAND COUNTIES	Professor Ohm	Royal Agricultural College, Cirencester.	34	34	47·1	44·1	8·8	
	E. E. Harcourt-Vernon	Grove, Retford	30	30	53·4	40·0	3·3	Mr. M. Sutton, Reading, telegraphed for
	Martin J. Sutton	Kidmore Grange, Caversham, Reading.	36	36	52·8	41·7	5·5	continuance of forecasts, and remarked
5. ENGLAND, S.								that they were never more necessary
	C. Whitehead	Barming House, Maidstone	36	36	50·0	44·5	5·5	or appreciated in the district.
	E. P. Squarey	The Moot, Downton, Wilts	36	30	53·3	36·7	6·7	Mr. E. P. Squarey says, "They are
	G. M. Allender	Stammerham, Horsham	36	36	52·8	41·7	5·5	"looked to with much interest by
6. SCOTLAND, W.	W. Calder	Castle Hill, Dalreock, Dumbarton	30	30	60·0	30·0	10·0	"my neighbours"
	M. J. Stewart, M.P.	Ardwell, Stranraer	30	30	63·3	23·3	13·4	
	J. S. R. Ballingal	Eallabus House, Islay	30	30	56·7	30·0	13·3	
7. ENGLAND, N.W.	The Earl of Derby, K.G.	Knowsley, Prescot	30	30	43·3	43·3	10·0	
	G. W. Wray	Leyburn, R.S.O., Yorks.	30	30	50·0	33·3	13·4	The Earl of Ducie says, "I am so satis-
	The Earl of Ducie	Tortworth, Gloucestershire	36	36	58·3	38·9	2·8	"fied with the importance of these
8. ENGLAND, S.W.	T. Dyke	Long Ashton, Clifton, Bristol	36	36	50·0	41·7	8·3	"forecasts, and of the opportunities
	R. Neville Grenville	Butleigh Court, Glastonbury	42	42	45·2	35·7	16·7	"of testing them, that no application
	Col. T. P. Turberville	Ewenny Priory, Bridgend, Gla- morganshire.	36	36	55·6	27·8	16·6	"tome (to receive them) is necessary."
9. IRELAND, N.	E. F. Farrell	Moynalty, Co. Meath	30	30	53·3	36·7	3·3	Mr. Wilson, of Currygrane, made re-
	J. M. Wilson	Currygrane, Edgeworthstown	55	53	56·6	37·7	5·7	peated applications for the forecasts
	W. Talbot Crosbie	Ardfert Abbey, Tralee	30	30	50·0	40·0	6·7	to be continued after the usual time.
10. IRELAND, S.	D. A. Milward	Lavinstown, Kilkenny	30	30	50·0	30·0	3·3	
	J. Wright for the Earl of Rosse.	Parsonstown	40	24	50·0	41·7	4·2	

Submitted—The following list of publications which had been received since the last meeting :—

Moureaux, T.—Résumé des observations météorologiques faites par M. Hervé Mangon à Brécourt (Manche), de 1868 à 1889.

Hagström, K. L., and Falk, A.—Mesures de nuages faites dans les montagnes de Jemtland pendant l'été de 1887.

Shanghai, Inspectorate General of Customs.—List of the Chinese lighthouses, light-vessels, buoys, and beacons for 1891.

Washington, Signal Office.—Report upon cold waves. Extract No. 5 from Annual Report of the Chief Signal Officer, 1890.

— Report of rainfall in Washington Territory, Oregon, California, Idaho, Nevada, Utah, Arizona, Colorado, Wyoming, New Mexico, Indian Territory, and Texas, for from two to forty years.

Carruthers, G. T.—The variation of the magnetic needle at Paris.

Roosenburg, L.—Cyclonen en de manoeuvres die er betrekking op hebben.